PLANS AND METHODS FOR THE SCHOOLROOM

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PLANS

AND

METHODS

FOR THE

SCHOOL-ROOM

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MORNING GREETING

Swinstead.

PLANS AND METHODS FOR THE SCHOOL-ROOM

LESSONS ON COMMON OBJECTS.

OBJECT-LESSONS are given chiefly to cultivate in children the habit of accurate observation. The importance of this habit can scarcely be overrated, since all reasoning and work must be based on fact, or what we suppose to be fact. Few errors arise from wilfulness, compared with those that arise from want of care and exactness in noticing things quite easily noticeable.

Indirectly, these lessons train to accuracy of expression both in language and in drawing; for tongue and hand will both feel the influence of the truly-informed mind. They should excite a spirit of inquiry and experiment, of intelligent interest in the production of the object, and sympathy with the people concerned in producing it. They should form a stepping-stone to the more formal study of science; or where this formal study is impossible, a substitute for it.

A beginner generally attempts to do too much in one lesson, and so lays on her pupils a burden of mere words: or she wastes time in noticing qualities that are unimportant, while the characteristic features or qualities of the object are passed lightly over. She not unfrequently takes for her subject some *un*-common thing of which but few specimens can be obtained, and keeps it in her own hand or on the table; whereas she should, if possible, furnish every child with a specimen, that each may learn to examine and describe for herself; or, failing this, should choose some object large enough to be easily seen by every child in the class.

It is obviously possible to treat animals as common objects and to observe their appearance, parts, covering, and so on, without regard to their peculiarities or habits as living things. Where the teacher desires to treat an animal in this way,

a bold-drawn diagram is required, showing the parts distinctly. Lessons on Form, Color, and other properties of objects, may also fairly be included in this series: in these, a number of different objects will be required for one lesson, as means of comparison and illustration.

— F. A. STEELE.

AIDS TO SUCCESSFUL ORAL TEACHING.

Intelligent Sketch Writing.— Assuming that good and suitable matter has been collected, it should be converted into a sketch.

First Rule.—*Consider the mental capacity and probable attainments of the children.*— Having done this, choose those parts of the subject which are fitted for both, and take as much of the subject as can be taught in the time allotted to the lesson.

A disregard of this rule lies at the root of many failures both in sketch writing and in lesson giving.

Second Rule.—*Determine in your own mind the order in which the subject shall be taught.*—In other words, make sure that your starting point is the right one.

It may be laid down as a general principle that the proper starting point of every lesson given to young children is that part of the subject which is nearest the experience of the child. Thus in lessons on "Common Things" the *use* of the object is nearer the child's experience than its *qualities*, and the *qualities* nearer than its *manufacture* and *commercial* value. This then should be the teaching order of such subjects.

Again, in lessons on "Natural History" the parts and habits of the animals are matters which can be and are observed by children, while the life history of the creature and its place in nature lie beyond the range of their experience. Here again we see the proper teaching order of all such subjects.

Violation of the rule.— We have before us a number of sketches on "Common Things" written by students in a Training School, in which it is proposed to commence the lesson with the nature of the object and the locality in which it is found: then the qualities and uses of the object are considered.

We have also on our study-table a volume of *Notes of Lessons for Primary Teachers*, in which out of fifty lessons given, one-half are constructed on the above plan. In both cases the starting-point is the unknown and distant, and the goal to be reached is the known and present. Whereas the true teaching order should be the very reverse of this, or, "*from the known to the unknown.*"

Third Rule.—*Determine what is to be the special point or points of the lesson, and state the same at the head of the sketch.*— In preparing a lesson teachers should not be concerned with what *can* be said about the subject in hand, but with *what of the subject is most suited to children's minds and acquirements*, and what they can receive and digest in the time allotted for the lesson. A disregard of this is the cause of many mistakes made by young teachers. An example or two taken from sketches sent in to the writer for criticism will make this point clear.

Violations of this rule:

Subject.— *Silk.* Age of children — *6 years.* Time at the teacher's disposal—*30 minutes.*

Points proposed to be taken up: 1. Nature of the object. 2. From what obtained. 3. History of the silk-worm moth. Eggs—larva— cocoon — chrysalis — moth. 4. Home of the silkworm. 5. Use of silk. 6. Preparation of the raw silk. 7. Manufacture of silken fabrics.

Passing over, for the present at least, the defective arrangement of the lesson, we may point out that the ground covered is far too wide for the children for whom the lesson is intended, and the matter is far more than could be given in half an hour.

A second example may be added:

Subject.—*Hive Bees.* Age of children—$5\frac{1}{2}$ *years.* Time allowed—*25 minutes.*

Points to be worked out: 1. Time of day in which bees work. 2. Instinct by which bees find (*a*) the honey (*b*) their way back to their hives. 3. Means by which bees extract the nectar from the flowers and bring it to the home of the bees. 4. Hive bees—kinds in each hive. 5. Work of each kind. 6. Moral lessons enforced: (*a*) industry, (*b*) order, (*c*) forethought.

It does not require much educational acumen to see that if such a lesson were given it must of necessity be a failure. In the first place, it would be quite impossible to go through all the points named in the time allotted for the lesson; and in the second place, the starting-point, the *Instinct*, is altogether beyond such young children. Yet many such lessons are attempted, and as a matter of course as many failures occur.

Fourth Rule.—*Take care that the points of the lesson follow each other in their teaching order.*—The information which has been collected will naturally be placed in the teacher's mind in the order in which it has been acquired, but this order may not be the one in which it should be imparted to the children.

Teachers must therefore analyze the subject in hand, and commence with that which is simple and elementary, and so arrange their points that they may proceed by a series of well-graduated steps to that which is more difficult or complex in its character. When this is done the ideas presented will be received in their right order, their suitable connection felt, and the whole will be adjusted satisfactorily in the mind

Violation of this rule. The effect of disregarding this rule is sadly evident in many of the sketches prepared by young students. We give an example or two which lately came under our notice.

A. *Lesson on Coal to children eight years of age.* Order proposed: 1. The formation of coal. 2. Qualities. 3. The occurrence of coal. 4. Means of obtaining coal.

Here, it will be observed, the teacher proposes to start with the most difficult part of the subject,—a part, too, quite unfitted for young children because it lies beyond the range of observation or experiment, and leads to the region of speculation.

The more fitting order would have been: 1. Uses to which coal is put. 2. Qualities which render it useful. 3. Where coal is found and how obtained. For elder children to these may be added: 1. The details of coal-mining. 5. Commercial value. And lastly, The formation of coal.

B. *Lesson on silk to children six years of age.* Order proposed: 1. Nature of silk. 2. How obtained. 3. Changes which the silk-worm moth undergoes. 4. Silk-producing countries. 5. Uses of silk. 6. Manufacture of silken goods.

A better order would be: 1. Qualities of silk. 2. Uses to which it is put. 3. From what silk is obtained. And for children somewhat older, 4. How silk is prepared for use.

—J. HASSELL.

GENERAL EXERCISES.

Let the pupil write or tell lists of articles found for sale in groceries. Have this neatly written on the board in full sight of the pupils, as early in the week as Wednesday. Have it understood that on Friday afternoon, with the maps before the school, and with the books of reference near by, time will be spent in talking about these various things. From what countries they come, how they are produced, for what are they used, etc. Let all who can, find pictures to illustrate any of these points. The teacher needs to have a little supply of general knowledge, in order to "chink in" and to direct the talk along certain lines. The tea, coffee, spices, dates, olives, flour, sugar, etc., will bring out many interesting ideas. It will assist this exercise, if as in the Dowagiac schools, a large map of the United States, or of the world, be outlined on a blank floor space. Move off the teacher's desk and make the map on the rostrum. On this map let the various articles be piled as nearly in the locality of their growth as possible. Control the talk and make of it all a language lesson.—*Michigan Moderator.*

LIFE UPON THE EARTH.

(Lessons for the little ones.)

MATTER TO BE TAUGHT.

I.

SOME things do not grow, they are called minerals. Other things grow, they are called plants and animals. Plants cannot feel and cannot move if they want to. Animals can feel and can move because they want to.

II.

Plants need sunlight, warmth and moisture: animals feed on plants and on other animals.

III.

Plants and animals are useful to man for food, shelter and clothing.

IV.

After these things are taught, take up, one after another, the most important plants and animals of the town in which the children live.

Suggestions.— For several weeks before the lessons are given, the children should have the care of some plants in pots in the window or in beds in the yard. To lead them to see that plants grow, bring into the class the day of the lesson a young plant like one of those of which they have had the care. Make them see that animals grow also, and that stones do not. To show the class that animals feel, call a child to you, and having made him shut his eyes, touch him. Require him to tell what you did and how he knows. Have him walk across the room to show him he can move when he wants to. Now by questions upon different objects make these points marked I. under matter to be taught. By referring to their experience, you can easily teach No. II. to the children.

The following may suggest ways of fixing in the minds of the children what they have learned:

a. Occasionally place upon your table different objects and have the children classify them by writing the names of the animal substances after the word animal, the names of the vegetable substances after the word plant, and the names of the mineral substances after the word mineral.

In a few days quite difficult lessons may be given the class, something like the following: — Place upon your table a piece of leather, a pair of kid gloves, a glass of water, some bread, some butter, a piece of wood, and empty glass bottle (to make the children tell what the air in it is). On their slates will appear the following, Animal.— leather, kid, butter; Plant.— bread, wood; Mineral,— water, air. Be sure to make the children understand that ceasing to grow does not change a vegetable substance to a mineral.

b. Have them name some of the things they had for dinner and tell what were animal, vegetable, and what were mineral substances.

c. Allow them sometimes to play for a few minutes, a little game in which some child thinks of an animal, a plant or a mineral and the others guess what he has in his mind.

Other lessons with objects will teach them that plants are useful to man, for food, for shelter, and for clothing. They can then study one after another the most important plants of the region and their uses to man.

— Elvira Carver.

PERSONAL DESCRIPTION.

If this suggestion could be carried out in the spirit of the Golden Rule, it might be useful as a composition exercise.

Teachers will require each pupil to write about some other member of the class. Then let each description be read, omitting the name, and allow the class to guess the name from the description.

Outline.— 1. General. Age, height—tall, short, or medium; body — stout, slender, thin, spare, corpulent.

2. Complexion. Dark, brunette, blonde, light, fair; color of eyes, hair, cheeks, etc.

3. Features. Forehead — high or low, etc.; nose large, small, Roman, Grecian; eyes — large, small, dull expressive; mouth, lips, teeth, ears, etc.

4. Dress. Material, color, style, etc.

NOTES OF LESSON ON

THE CAT.

General Purpose.—The subjects selected should be those which the child has frequent opportunities for observing. These will form the preparation for lessons on the less known examples of animal life. Pictures and toy models must necessarily take the place of the objects. The method of each lesson should, therefore, consist chiefly in a careful use of the picture; the teacher should draw out the facts about the form and habits which the children have already observed; correcting and extending their observations, leading them to notice the simpler structural adaptations. Black-board drawings should be freely used.

I.—The Picture Examined.

1. Teacher pointing to a picture of a cat. What is this picture? What is pussy doing? What is she looking at? etc.

2. What part of the cat am I pointing to?

The head.

And now?

The back: the body.

And now?

The legs."

a. Let us look at the HEAD: what is its shape? I will draw the shape on the blackboard, leaving out the ears: what shape is it?

Round.

Now let me see if you can name all the parts of the head? (The children are caused to name and point out the *ears*, *eyes*, *nose* and *mouth*)

b. How many EARS has pussy? How many have you? On which part of your head are the ears placed? Look at the cat's ears: are they in the same place as yours? Where are your ears?

FIG. 1.

At the sides of the head.

Where are the cat's?

Nearly on the top—higher up.

Yes, pussy's ears look like little horns on the top of her head. What *shape* are they? (Teacher draws outline of child's ear and the cat's on the blackboard. Fig. 1.) When the cat hears a little noise, what does she do with her ears? Which way does she turn them? Can you move your ears What do you do instead?

c. The EYE is next taken, and the children are led to observe its *position*, *shape* and *color*. Look at my eye: what do you see in the middle?

FIG. 2.

A black spot.

What shape is it?

Round.

Look at the picture: what shape is the black part of the cat's eye? Who has seen the cat's eye at night? What shape is it then? (The teacher draws on the blackboard the eye at it appears at daylight and at night. Fig. 2.) How is it the cat's eye looks so large and black at night? I will show you. What do we do to the window when the light shines upon us?

We pull down the blind.

Why? What do we do when the sun is gone? (The teacher then explains that the cat's eye has a blind which falls down during the strong light of the day, and draws back at night when there is little light.)

d. The MOUTH, with its *sharp*, *pointed teeth*, and *long*, *rough tongue*; and the *whiskers* or *feelers* are noticed in order, and the uses of each part to the cat are carefully explained.

e. How many FEET has the cat? What do we call the two at the *front?* And the two behind? Are they shaped like our feet? Let us see. I will draw the shape of our feet and the cat's upon the blackboard. Which is the *long foot?* Which is the *round* foot? What shape would a cat's foot make on the wet ground? What shape, then, is its foot? How many toes have you? Now count how many toes pussy has on her front foot. See Fig. 3.

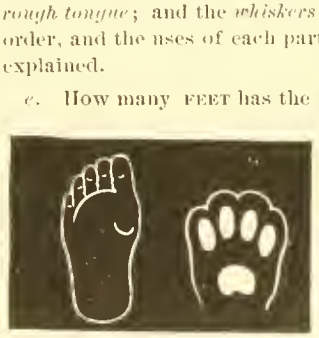


FIG. 3.

Five.

How many on her back foot?

Four.

What have you at the ends of your fingers and toes? What has the cat instead of nails? (The teacher draws the *shape* of the CLAW upon the black-board, get its *hook-like* form noticed, and show how the cat can thrust the claws out, or draw them in again when not in use.

The *soft, elastic cushions* under the feet are shown by a diagram, and their use explained. See Fig. 5.)

Fig. 4

f. Of what *color* is the cat in the picture? Are all cats of the same color? Name some of the colors of cats. Which of you have stroked a cat? What is pussy covered with?

Fur.

Her fur coat is beautifully warm; she does not need clothes. What is the fur made of? If you look at Pussy's coat when you get home, you will see that it is made up of many fine hairs, all growing very closely together. How does her coat look?

Shiny; smooth.

How does she keep it so shiny and smooth? Let us try to keep ourselves clean and neat, too.

II.—Habits.

Most of these the teacher will readily get from the class in reply to suitable questions. She will refer back to what has been taught about the structure to show how the needs of the animal have been provided for.

1. The Cat Indoors.—The teacher brings out the following points:

a. The cat is *fond of a house*, and goes all over it smelling and feeling till she knows it well. She *moves without noise*. How?

b. She likes to *sit in warm places; purrs; keeps herself clean*. (A lesson for children.)

c. Her food *indoors: milk*—how does she drink it? Meat: *mice*—how does she catch them?

2. The Cat out of Doors.

a. Likes to *sit in the sun*. Why?

b. *Catches birds*. How? She *watches, creeps, climbs, springs*.

III.—Useful Lessons.

1. What does pussy teach us? *To be clean; to be quiet; to be fond of home.*

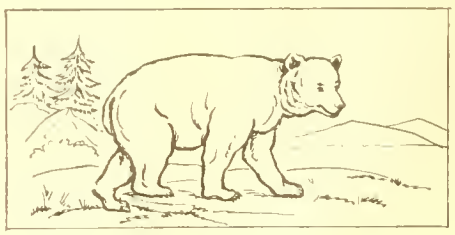
2. How kindly and gently we should treat her!

NOTES OF LESSON ON

THE BEAR.

I. Description.—Exhibit pictures of bear, (white, black and brown), and let the children compare them. Get answers, also, containing further particulars, if possible, from those who have seen live bears. From pictures, etc., learn—bear is a quadruped; three kinds; whites largest; black, smallest; heavy body, thick legs, long hair, strong paws with five toes; five to ten feet long; teeth like men's.

II. Habits and Food, and Locality Where Found.—*White* found in Arctic regions, hence food such as found there: seals, fish, seaweed; food caught by itself; walks on ice; feet covered with hair (why?) *Black* in America and India; vegetables and honey; *Brown* in Germany and other central countries of Europe; lives on flesh and vegetables. Disposition—surly, solitary, fierce, sagacious, fond of young. Sleeps during winter, like? (dormouse, squirrel, etc.) Hungry and angry in spring; then dangerous. Does not



THE BEAR.

attack man at other times, unless molested. Can be taught, if caught young.

III. Capture and Uses.—Very valuable animal, so captured. Tracked by dogs; shot or speared. Fur in great request, black the best, made into rugs, caps, and clothing. *Fat* made into bear's grease. *Hide* makes good leather; *flesh*, eaten.

Method.— Illustrate habits, etc., by stories where possible. Danger of hunting; affection for young—mother carrying her cubs before her.

COMPARISON BETWEEN THE DOG AND THE CAT.

INTRODUCTION. — Pictures of dog and of cat should be drawn on blackboard. First deal with each separately, recalling briefly the chief points of structure and of habit.

I. The Dog.—Its *shape*, *covering*, *parts*, *head*, *body*, *legs*, *tail*. The *mouth* large; the *teeth* strong, pointed, straight; position of the eyes; covering of hair; strong, stoutish legs: the *foot*, shape. Number and position of the hard, horny *nails*. The many different kinds, sizes, form and general appearance of dogs. Its young is called a *pup*.

II. The Cat.—In a similar way, deal generally with the points of its structure and habit; then the form *head*, *body*, *legs*, *tail*, and *feet*. The round eyes change in color and even in shape as the light changes. The mouth and its sharp rows of teeth; the *feelers* or whiskers; position of eyes and ears; the quickness of its sight and hearing; the *covering*, soft, smooth, and glossy; the long, easily-bent body; the strong, quick-running legs; the soft-padded paw, each toe ending with a sharp, strong claw, which can be quickly drawn in or thrust out; the long, round tail; its young is a kitten.

III. The Comparison.— The chief points of comparison should be as far as possible brought out by questioning from the children point by point.

THE DOG.

Body. — Strong, active, stout.

Head. — Long, pointed, nose keen of scent, eyes far back, can see at a distance. It hunts by sight and smell chiefly. Catches its prey in the light only.

Foot.— Roundish, the toe nail hard and horny. It catches its prey with its mouth.

Voice.— Barking, growling.
Lives in a kennel.
Often chained up.
The *young* a pup.

THE CAT.

Lithe, supple, active.

Roundish: eyes can see with less light: whiskers, able to feel what cannot be seen; ears and eyes quick of hearing and sight. It hunts chiefly by sight and hearing; can catch its prey in the dark.

Padded, can run with little or no noise: claws sheathed and so kept sharp. It catches its prey with its claws. It can climb trees and walls, etc.

Mewing, purring.
In the house.
Left free.
A kitten.

Both dog and cat are tamed and made of use in our homes. When wild they are beasts of prey; both feed chiefly on flesh. (*Revision.*)

NOTES OF LESSON ON

COWS.

INTRODUCTION.— Show pictures or black-board drawings of cows and let children give name. After this show others of the tribe — *zebu*, *buffalo*, *bison*, *yak* and *musk ox*, and tell them that all these animals belong to one family and are much alike in uses and habits, though they live in different parts of the world.

Where Found.— Some animals of the cow kind are found in every part of the world. We have the *ox* and *buffalo*. The *zebu* lives in *India*, *China*, and *Eastern Africa*, the *yak* in the mountainous parts of *Central Asia*, and the *musk ox* in the extreme north of America. Show these countries on a globe or map.

Size.— All the animals of this family are large in size, except the yak and musk-ox. Our own oxen reach a very large size, but are surpassed by the buffaloes.

Covering.— Most of those animals are covered with short hair. In our own cows the color may be white, brown, black, or mixed. *Bisons* and *buffaloes* are dark brown or black, with a lot of long hair around the head and neck; the *zebu* is a pale gray or cream color; the *yak* has long, black hair, that on the hump, mane, and tail being nearly white; the *musk ox*, who lives in cold regions, has a hugh mass of wooly hair of a yellowish-brown color.

Body.— The bodies of these animals are large and heavy, several species being furnished with humps, *e. g.*, the *zebu*, *bison*, *buffalo* and *yak*.

Legs.— Generally speaking, the legs are short and thick, with cloven hoofs.

Head.— This is large, with fine, fierce *eyes*, and *horns* of different shapes, those of the bison and buffalo being very formidable. The *neck* is usually short and thick.

Food.— All the animals of the ox tribe eat grass and other vegetables, chewing the cud as described in the lessons on "*Ruminants.*" The domestic cattle are fed on hay, turnips, carrots, etc., in the winter time.

Character.— These animals are naturally fierce and courageous. When wild they are, especially the buffaloes and bisons, very formidable, but when tamed become most useful to man.

Uses.— As a class these animals stand first for usefulness. One member of the family at least is found in nearly every country, where its uses are much like those of our own species, the domestic cow. Its uses are:—

To Give Milk.— This is abundant, rich and nourishing.

To Labor.— In many parts oxen are still used to draw the plough or wagon.

To Provide Food.— Its flesh furnishes us with one of the most savory and nourishing of our animal foods.

To Give Horn.— Which furnishes material for making the handles of knives and forks, and many other things.

To Give Hide.— Its skin or hide is thick, and makes most durable leather.

To Furnish Glue.—This substance is made from its hoofs, ears, and hide parings.

To Give Hair.— This is used to mix with plaster for building.

To Furnish Animal Charcoal.— This is obtained from its bones.

Questions.— What do we get from oxen? Which of the oxen family is most useful? To what class do oxen belong? And to what tribe? How do they rank with other animals in point of usefulness? Tell some anecdotes of a cow? Of a buffalo? Where does the zebu live? Which is the larger animal, the bull or the buffalo?

Debat-Ponsan.

NOTES OF LESSON ON

THE HORSE.

INTRODUCTION.— Refer to what the children see and know of horses as seen day by day. In towns and cities the great numbers seen, drawing carts, wagons, carriages, etc. All are at work. They differ in *size*, and *strength* and *color*. Which kind of work will need the strongest? Why? Which needs the quickest? Note the difference between the stout, strong *cart-horse*, the more slender *carriage-horse*, the delicate *race-horse*. How strong the horse is! How fast and long it can run. Yet it is *gentle*, and generally *quiet*. It will not harm a child. On its feet are iron shoes. Why are they there? How are they fastened? Why do not the nails hurt its foot?

Description of the Horse.— Show pictures of horses. Describe and elicit its general *shape*, *size*, *appearance*. The large long *body*, the wide *neck*, the large long *head*. Its *legs* strong and firm. The horny *hoof*, the *mane*. Where placed. The *tail*, when left to grow as it will, long and bushy. Sometimes it is cut short. The *ears* pointed and movable. It can hear quickly. The *eyes* large; placed high. It can see a long way. The *nostrils* wide; it can smell quickly. In the mouth are the *teeth* and the *tongue*. The front teeth are long and sharp. Between them and the back teeth is a large space. Here is where the *bit* is placed. What is it made of, and its use. The back teeth are broad and sharp. With the front teeth it *cuts* its food; with the back it *grinds* it. What is the body covered with? The *hair* is short, soft, close, of different colors. The horse can *walk*, *trot*, *gallop*. The differences of these?

Its voice is called *neighing*.

Habits, Food, etc.— There are *wild horses* in some places. These live many together, as sheep and cows do. Such a number is called a *herd*. What other animals live in herds? What is a number of sheep called? In most lands all horses are *tame*. They are kept for the work they do. What food do they eat? *Grass*, *hay*, *oats*, *turnips*, *etc.* What one name may be given to these? *The horse feeds on vegetables.* Other tame animals which do so? Other wild animals? Name some that feed on flesh. What is the place called in which the horse lives? In the stable are a *rack* for hay, a *trough* for corn, a *pail* for water, *straw* to lie upon. The young horse is a *colt*; when very young a *foal*. Horses are named according to the work they do. There are *cart-horses*, *carriage-horses*, *race-horses*, *etc.* In all times and places men have made use of the horse.

Think of the many ways in which they are of use. In the *country;* in *town*.

Use When Dead.— The *skin* is made into leather. For this it has to be *tanned*. The *hair* is used for stuffing *cushions*, *chairs*, and *sofas*.

The long hair of the tail is woven into horsehair cloth. Its *hoof* makes glue. The *fat* for soap. The *bones* for knife-handles or burnt for manure.

Revision.— Let the horse be the subject for the next composition exercise, the children, meanwhile, finding out all they can about horses. When practical, they may illustrate their compositions with an outline drawing of a horse. Memory Gems will also be in order.

—N. S. EDWARDS.

"A man of kindness to his beast is kind,
But brutal actions show a brutal mind;
Remember *He* who made thee, made the brute;
Who gave *thee* speech and reason formed *him* mute.
He can't complain, but God's all-seeing eye
Beholds *thy* cruelty, and hears *his* cry;
He was designed thy servant, not thy drudge;
And know that *His* Creator is *thy* Judge."

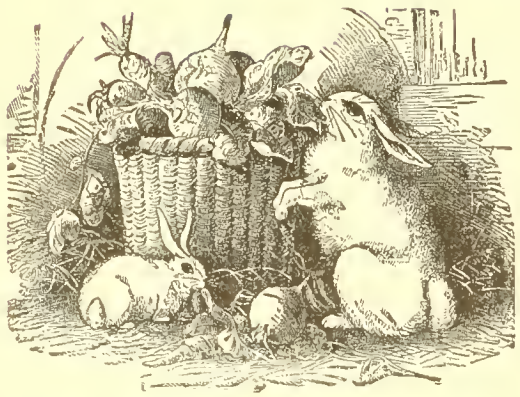
—ANON.

PHARAOH'S HORSES.

Herring.

NOTES OF LESSON ON

THE RABBIT.



A BLACK-BOARD drawing of the rabbit will be needed, or, even better, when judiciously used, a living rabbit may be employed with advantage for illustration.

General Description.— First show the picture or specimen, and speak in general terms of the chief points of structure — its pretty appearance; its soft, furry covering; the bright, large eye, long ears; its gentle timid nature, so easily frightened when wild, running off to hide itself as one gets near, etc. Then speak of *where* and *how it lives*. Children often see rabbits as kept in their homes or the homes of neighbors. These are *tame*. Why so kept? They are pretty to look at and easily attended to. From them we may learn something about—

Wild Rabbits.— Children living in the country often see them. Where should we look for them? *In fields and woods*. Early in the morning, or as evening comes on, they may be seen running in the grass, or in the fields. They are busy cropping the grass, munching the turnips, sometimes getting into the gardens. What they seek there. What their food is. The mischief they often do by eating the young crops, etc. How pretty they look; how watchful they are; how quick to see, to hear, if we go near, or if any noise be made how quickly they scamper off. They are all soon out of sight. Where do they go? They run into *holes in the ground*. Describe how they scrape away the earth with their strong feet and sharp nails at the end of the toes. The long, underground *burrow*; a number of these winding paths near together make a *warren*? What, then, is a warren? What is a burrow? How is the burrow made? Explain that these are dug usually in loose, sandy soil, though sometimes made in the earthy parts, among rocks and stones.

Form and Parts of a Rabbit.— By help of picture and specimen describe *size and general form*. Round head; shortish, round body, small upturned tail; the four legs, the *hinder longer* than the two *fore legs*; the covering of soft, warm, brownish-gray fur, etc.

The Head, round, moving quickly on the short, thick neck; the *eyes* large; where placed, standing well out. Why this is, what it enables the rabbit to do; the long ears, how they hang; their quick motion, and reason of this; the mouth and teeth; show clearly the four front teeth: two above, two below, shaped like sharp *chisels*; their *nibbling* action, how used, other animals like them. Bark of trees, young wood, turnips, grass, etc, all *nibbled* in the same way.

Body and Tail. Describe again. Different appearance when running, sitting, etc. The covering. Difference of color in wild rabbits and many tame ones: the later often *white*, *black*, or *spotted*, or rich brown color.

Feet and Legs. Shape, four toes on each foot, ending in the strong nail; use of this in burrowing.

The rabbit is timid, caught in traps, or shot; their flesh is used for food, and the skin for cheap furs, etc. Many birds, and beasts of prey also eate

the rabbit and feed on them. The quick sight and hearing and running, enable the rabbit often to escape from danger.

The hare belongs to the same family as the rabbit, and although resembling the latter in many points, may be easily distinguished by having a longer head and ears; the ears with a black tip, and the upper surface of the tail has not that brown color found in the rabbit. It does not hide in burrows like the rabbit, but trusts to its great speed to elude its numerous enemies.

Questions.— Have we any use for rabbits? Why do we keep them sometimes? Have you ever seen one? Is the rabbit a fierce animal?

RABBITS AT HOME.

NOTES OF LESSON ON

THE FOX.

GENERAL DESCRIPTION. — By aid of a good picture, drawing or stencil outline on black-board, bring clearly out the general features of structure and appearance. Its *name*; general likeness to the *dog*: *size*, *color*; *nose sharper*, and *bushier tail* than the dog's; *lithe*, *active*, *strong-looking*.

The Head.— Erect, tapering; ears standing straight up, pointed; eyes bright, keen-looking, set forward; mouth open wide, showing two rows of strong, sharp-pointed teeth; neck, longish, stout, standing straight up from shoulders, so as to lift the head well above the body.

The Body.— Long, large deep chest, giving plenty of breath, so enabling it to keep on running for a long time; covered with thick-growing, yellowish-brown, softish *hair* or *fur*. The Tail.— Straight, bushy, tipped with white. Make very clear the distinctiveness of the bushy tail, sometimes called the *brush*.

The Legs.— Stout, strong-looking, feet thickish; its four toes, each having a strong claw, not sharp as the cat's is. How does the cat keep its claws sharp? The fox cannot draw its claws in, so they get blunted by running over the stones and earth.

Where and How the Fox Lives?— Ask if any have seen a fox, and where? Children living in the country may have done so. They will tell where it may be seen. So bring out that the fox is a *wild animal*. It lives in woods, getting into a hole in the earth. Sometimes it lives in a hole in the stump of an old tree. Its young ones are sometimes so found. What is the food of the fox? It feeds on the *flesh of other animals*. It catches living creatures. *The fox is a beast of prey*. Describe its cunning, crafty ways of hunting them; its stealing at night into the poultry house or farm-yard; catching poultry, rabbits, young birds, even mice and frogs, if it can get nothing better. It is quick in hearing, smelling, and seeing, so is difficult to catch.

Kinds of Fox and Uses Made of Them. — The fox of our land is called the common fox. In very cold lands lives the Arctic Fox. It is smaller than the fox of this land. Its fur or hair is white or bluish-gray, very thick, long and soft; its feet and legs very hairy. Why does it need such a covering? It is caught in traps and snares for the sake of its fine fur. The skin is very valuable, and is used for trimming cloaks and dresses. The people living in the cold northern lands sometimes eat the flesh of the fox.

Questions.— What animal does the fox resemble? In what points does it resemble the dog? What sort of a tail has it? What is the tail sometimes called, and by whom? Is the fox a wild animal? Since it catches and feeds on other animals, what is it called? In what way are foxes used for sport? For what are its tendons used?

ANECDOTE.

A gentleman, who was a great hunter, once had a beautiful fox, which he had kept for some months, intending to use him for sporting purposes. After a time, the animal learned to know his voice, and would allow no one else to go near him, so a sort of kennel was made for him in the loft of the stable, and the gentleman would visit him every day and bring him food.

One evening he returned late at night from a journey which had kept him all day from home, and taking a lantern, proceeded to the stable to see if the fox was all right. He found him crouched at the foot of the steps which led to the loft, and although he manifested great pleasure at seeing his master, yet when he attempted to ascend the loft, the fox immediately ran in front of him, snarling and showing his teeth, and using every effort to prevent his going up.

On lights and help being procured it was discovered that some of the upper flooring had given way, leaving a formidable hole, through which, if the gentleman had gone up with no other light than the dim lantern, he would undoubtedly have fallen through, and perhaps have been seriously injured. It is gratifying to know that the hunter never allowed that fox to be chased by his dogs, but kept him for years, so that after a time he used to follow him around the grounds like a dog.

NOTES OF LESSON ON

THE LEOPARD.

INTRODUCTION.—Show pictures or black-board drawings of a tiger and a leopard; let children notice the most striking likenesses and differences; tell the name of the smaller animal.

Where Found.—The leopard abounds in Africa and Southern Asia. Show these countries on a large globe; let children tell where lions and tigers are found.

Size.—He is smaller than the tiger, measuring about three feet from nose to root of tail, with a tail of two feet, three inches, and standing somewhat more than two feet high. Compare with the picture and with the size of a large dog.

Covering.—He has a beautiful skin, the fur of which is yellow on the upper part and white on the under parts, breast, and inside the limbs. It is marked with black spots; those on the head, neck, back and limbs being of various sizes, irregularly dispersed, while those on the sides are large, consisting of small ones arranged in circles. There are ten rows of these spots.

Shape.—His form is particularly graceful and elegant.

Head.—This is smaller in proportion than that of the tiger; it has small erect *ears*, bright *eyes*, and very sharp *teeth*, like all the cat tribe. His *whiskers* are long and white.

Legs.—These resemble the tiger's, and have the same padded feet with retractile claws.

Tail.—Long and round, gets more slender towards the end.

Compare his structure with that of the domestic cat.

Home.—He lives in the forests, where he loves to climb the trees and catch the monkeys and other tree-loving animals.

Food.—His prey consists of antelopes, hares, monkeys, sheep and cows. He is sly and crafty, as well as strong and fierce, and by stealth will gain admission into poultry-yards, and with one swoop destroy all the fowls roosting therein. The leopard seldom attacks man, and when he does so, it is by stealth. If pursued, and brought to bay, he will fight with much ferocity and courage. The Africans make much of those warriors who have killed a leopard.

Movements.—The leopard is extremely agile; it can run, leap and climb well. Compare and contrast with *lion*, *tiger*, etc.

Character.—Leopards are fierce and bloodthirsty, crafty and sly. They may be tamed, but can never be entirely trusted. They lay up provisions for the future.

Methods of Capture.—The leopard is sometimes shot, but is generally caught in pitfalls, which are slightly covered with branches of trees, on which pieces of meat are placed.

Tell any other anecdotes that you may know, to illustrate the leopard's habits.

One small species of leopard is called the *cheetah*, and is tamed and used for hunting in India. There is also, an animal called the *leopard cat* found in these same countries, and in the East Indies, which is small, like the cat, and spotted like the leopard, thus combining the two animals.

The *panther* is regarded by some as a species of leopard, though of larger size, with large ring-like spots, the centre darker than the color of the body.

Questions.—Its size? Shape? Covering? How it may be known? By its *spots*. A beast of prey covered with stripes? What animal in this land is like the leopard? In what is the cat like the leopard? How does the leopard catch its prey? What animals are caught by it? Where does the leopard live?

BLACK-BOARD OUTLINE

NOTES OF LESSON ON

THE TIGER.

LOWEST PRIMARY CLASS.

A PREVIOUSLY developed lesson on the cat, a black-board picture of a tiger, hidden by a screen, a class of thirty, eager children anxiously awaiting the removal of the screen, and class and teacher are ready for a talk about the tiger. A short story, introducing men, mounted on elephants, in distant Asia, as hunting for ———— the cloth is removed, and most of the little ones will tell you that the object of the hunters' search was a tiger.

Teacher.— Look carefully, and tell me if this tiger looks like any other animal you have seen.

Pupil.— It looks to me just like a cat. Several think the same.

Teacher.— Ben is walking to church with his little brother Alfred. People say that it must be Ben's little brother. I wonder why they would think so?

Pupil.— Because his clothes are just like Ben's.

Teacher.— Yes, perhaps so, but who can think of any other reason?

Pupil.— Because he *looks* so much like Ben.

Teacher.— Yes, now you tell me the tiger looks like a cat. Well what relation do you suppose he is to the cat?

Pupil.— He must be his brother, I think.

Teacher.— So he is. Now look at him and tell me what about him looks like his little brother, the cat.

Pupil.— He has whiskers like the cat.

Pupil.— He has four feet and legs.

Pupil.— He has a tail just like a cat only larger.

Pupil.— His ears look like a cat's.

Teacher.— Yes, find now some things about this tiger that are not like the cat.

Pupil.— He is a great deal larger than the cat.

Teacher.— (Points to her shoulder, measuring height, and measures length on floor, letting several children measure distance.) He is a big fellow. What ought big brothers to do, when they have little ones a great deal smaller than themselves.

Pupil.— They ought to take care of the little brothers.

Teacher.— You look at the tiger and see if you think he looks as if he would be gentle and good to the dear little cat.

Pupil.— He looks too cross.

Teacher.— I am afraid he would be cross. Why, I think the first thing he would do would be to eat a little kitten, if he saw one. Look at his mouth and tell me why you think he could easily eat the kitten.

Pupil.— He has such a big mouth and such ugly teeth.

Teacher.— What else do you think he might eat? You know we said he lived in the woods and on the great plains, where the hunters search for them.

Pupil.— He could eat rabbits.

Pupil.— He might eat men if they came too near.

Teacher.— O yes, he is very fierce and would tear anything all to pieces.

Pupil.— He could find little animals to eat too.

Teacher.— Now who can find something else about this tiger that is not like the cat?

Pupil.— He isn't the same color.

Teacher.— What color was our kitten?

Pupil.— She was a gray cat.

Teacher.— What two colors has the tiger?

Pupil.— He is black and yellow.

Teacher.— (Pointing to a stripe.) Who can tell what we call this? It isn't a spot.

Pupil.— It is a stripe. Some cats have stripes too.

Teacher.— Yes, how many think he is not so pretty as the little kitten brother?

Teacher.— What does our little kitten do at night?

Pupil.— She has a good, warm chair to sleep in.

Teacher.— What do you suppose the tiger does?

Pupil.— He has to have his bed out in the woods.

Teacher.— Who can tell me of what good we said the little kittens are to us?

Pupil.— They catch mice.

Pupil.— We love our little kittens.

Pupil.— We like to see them play.

Teacher.— How many think we should like to see the tiger play? He wouldn't play very prettily with his little brother, would he? And how many think we should love the tiger? And we know he can't catch mice. Well, of what good can he be to anybody?

Still, how many think that the men wouldn't go out and try so hard to catch them, when it is so dangerous, if they were not of some good? Now I must tell you about the tiger's skin. We said it was what color? Yes, well they take that off and clean it very carefully, and what do you think they do with it? How many know what the man who sits on a throne is called?

Pupil.— A king.

Teacher.— Yes, they make these skins into great mats, and put them on the thrones, so that the kings and queens in these Eastern countries can sit on them; and they are very beautiful. How many think they can tell me of one use that the tiger is to the people?

Summary.— Have different children represent different parts of the tiger and objects connected with life and manners of the animal: tiger's body, his home, food, skin, etc. Have others in the room ask questions pertinent to the subject a child represents. Unconsciously and pleasantly they are reviewing the whole lesson.

—B. B. B.

NOTES OF LESSON ON

THE MONKEY.

GENERAL DESCRIPTION. — Show a good picture or drawing of the monkey. Use it throughout the description to illustrate the various points referred to. Describe in the usual way its general form and appearance. It is more like a man than any other animal is. Call attention to its head, body and limbs. It has two arms and two legs. At the end of each arm is a hand. Some have a thumb as well as fingers. How is the thumb of our hand put? At the side of the fingers, but we can move it opposite to them. Some monkeys have no thumb. What is at the end of the leg? At first it looks like a foot. It is really more like the hand. So the monkey is four-handed. We use the foot only for walking; we use the hand for holding or grasping. The monkey grasps or holds with its four hands. Note next its covering. It is *hairy*. The larger kinds are covered with *stout*, *coarse* hair. The smaller with *soft*, *silky* hair, more like fur. Look next at the face and head. The nose and the

mouth are stretched out, and somewhat pointed. Many are more like the nose and mouth of a dog than of a man. The monkey has a *tail*. There are kinds of monkeys without a tail. These have a different name. They are called *apes*. What is the difference between a *monkey* and an *ape*? The monkey has a tail. The ape has no tail.

Where and How Monkeys Live.—Their Ways. — Most of the children have probably seen a monkey. Ask where. What it was doing, etc. From this teach that the home of the monkey is in far-off lands. They live in hot countries, only in different parts of the world. They may have seen a monkey climbing and jumping actively about. This will lead to a description of the monkey in its own home. Picture vividly the great forests; the large numbers of monkeys to be seen in the boughs and at the tops of the trees; their *quick* and *active* movements; the wonderful jumps they take from one branch or tree to another; the strange noises they make; their funny, mischievous ways; the curious ways they have of imitating what they see, etc. They hold fast to the branch by their hand, and swing from bough to bough; some even twist the end of the tail round a branch and swing by it.

Lemur. — The lemur is a species of monkey, but of small size, having a sharp muzzle like the fox, and large eyes. They feed upon birds, insects and fruit. Are mostly found in Madagascar and the neighboring islands, one species particularly in Africa, the cat lemur being about the size of that animal, and another the size of a mouse.

Kinds of Monkeys. — There are monkeys which live always in the trees, seldom coming to the ground. Others live chiefly on the ground, among the rocks and hills. Some are large and strong and fierce; others are small and gentle, and playful in their ways. Some walk on all their hands, as dogs and horses do on all their feet.

Their Food. — They eat the fruit, leaves and twigs of many different sorts of trees and other plants. They climb the tall cocoa-nut trees and take the nuts. Also the dates from the date palm. Some also eat insects, the eggs of birds, etc. They get into the rice fields and amongst the sugar-canes, and do mischief in many ways in the gardens and fields which may be planted near their homes.

Questions. — What animal is most like man? In what way does it resemble us? Have you ever seen a monkey? What are its habits? Food, etc.? Are they mischievous? In what ways?

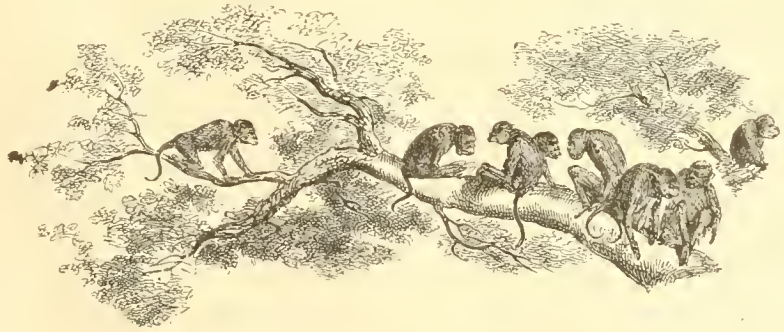


FIG. 1.—AGGAGEERS HUNTING AN ELEPHANT.

NOTES OF LESSON ON

THE ELEPHANT.

BLACK-BOARD PLAN.

I. DESCRIPTION.
   - a. *General description.*
   - b. *Special study of the trunk and its uses.*
   - c. *Age of elephant.*

II. KIND OF ANIMAL.
   Mammal — proboscidian.

III. KINDS OF ELEPHANTS. { *African.* / *Indian.*

IV. WHERE FOUND.

V. CHARACTER OF THE ELEPHANT.

VI. USES OF THE ELEPHANT.
   - a. *Indian.* { Beast of burden and of draught. / For hunting the tiger. / In warfare. / Ivory.
   - b. *African.* { Food. / Ivory.

VII. HUNTING THE ELEPHANT.

Description.—The elephant is the largest land animal of the world. It is usually from seven to nine feet in height. The largest are about twelve feet high, fifteen feet long, and weigh seven or more tons. Jumbo, whom the children of our

country and of England used to be so proud of, was not quite twelve feet high. Although the elephant is such a huge animal, we must not imagine he is anything like a whale in size. It would take five or six elephants standing one in front of another to equal a whale in length. The head of the elephant (See Fig. 3) is of great size and very strong. In a wild state he can pull down trees with it. He has large, flapping ears and bright, rather small eyes. The sharp teeth in the front part or our jaws and the jaws of other animals are called incisors, a name which means to cut. In the elephant, the incisors of the upper jaw are developed into long, tapering tusks (See Fig. 1) which increase in size as the animal grows old. They are very hard and white and are the ivory of which such beautiful ornaments and other things are made. The most remarkable thing about the elephant is his trunk. You may be surprised to learn that it is really his nose.

His upper lip and nose are drawn out or elongated into this conical tube, called a trunk or proboscis. The lower lip is triangular and forms a cavity into which the trunk can easily be thrust. The neck is necessarily short to sustain the weight of the heavy head. The body is thick and slopes towards the tail. The legs must needs be short and strong to support such an enormous body. Notice how stout they are. They look like the trunks of trees. The feet are immense and have each five toes. They are about half as large round as the animal is high, so if an elephant is twelve feet tall he will make a track about six feet in circumference. (The children can form some idea of the size of Jumbo's foot by tying a piece of crayon to a string a foot long and representing with it a circle on the floor) The skin is thick, dark and wrinkled, and has almost no hair upon it. You have perhaps heard of white elephants. They are made so by disease. White is not their natural color.

Trunk. — The elephant's trunk is so wonderful we will study that a little more. In a large animal it is as long as a tall man. It has a cut-off appearance at the end, or is truncated as we say. In this end you see the openings into the two nostrils (Fig. 2), which are long canals running entirely through the trunk into the head. The nostrils communicate with the head by two other holes which the elephant can open and close at will. For this reason he can fill his trunk with water and squirt it over himself or over others, as he sometimes does in sport, or when he is displeased. He is fond of swimming and can cross broad rivers.

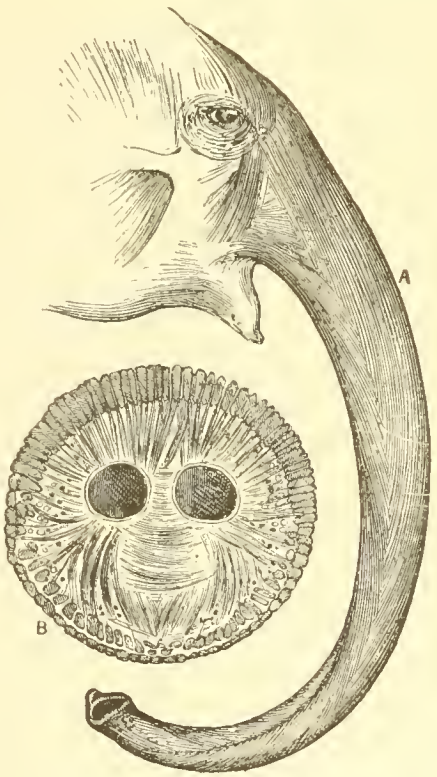


FIG. 2. — TRUNK OF ELEPHANT.
a. Muscles and Tendons. *b.* Transverse Section.

When he is swimming, the tip of his trunk only is visible above the surface of the water. It is kept there to enable him to breathe. Looking at Fig. 2 you see that at the extremity of the trunk there is a small part five or six inches long, which looks something like a finger. It bends so easily, or is so flexible and also so sensitive, that with it he can pick up a small object, fire off a pistol or uncork a bottle. He does so many things with this

and his trunk that the people of India call him by a name which means "the beast with a hand."

Use of the Trunk. — The food of the elephant in a wild state is herbs and the leaves of trees and shrubs. His neck is so short that he cannot get his mouth to the ground as the cow does, and other animals that feed upon herbage. Neither can he reach with it the foliage upon the branches above his head. The trunk, like its small finger-like part, is very flexible; so it can move up, down, sideways, or even roll up in a ball, (Fig. 2). The elephant can also lengthen and shorten it when he pleases. With it can he pull up a tuft of grass and carry it into his mouth, or pull down tall trees and strip the leaves from them to eat. Closing his nostrils at the upper end, he can fill his trunk with water and discharge it into his mouth to quench his thirst. We see, then, that one use of the elephant's trunk is to enable him to eat and drink. In fact, if it were injured so that he could not use it, he would soon die. Nor is this all. It is his principal means of defense. He can twine it about an enemy and toss him into the air, or hurl him to the ground and trample upon him, or rend him with his tusks.

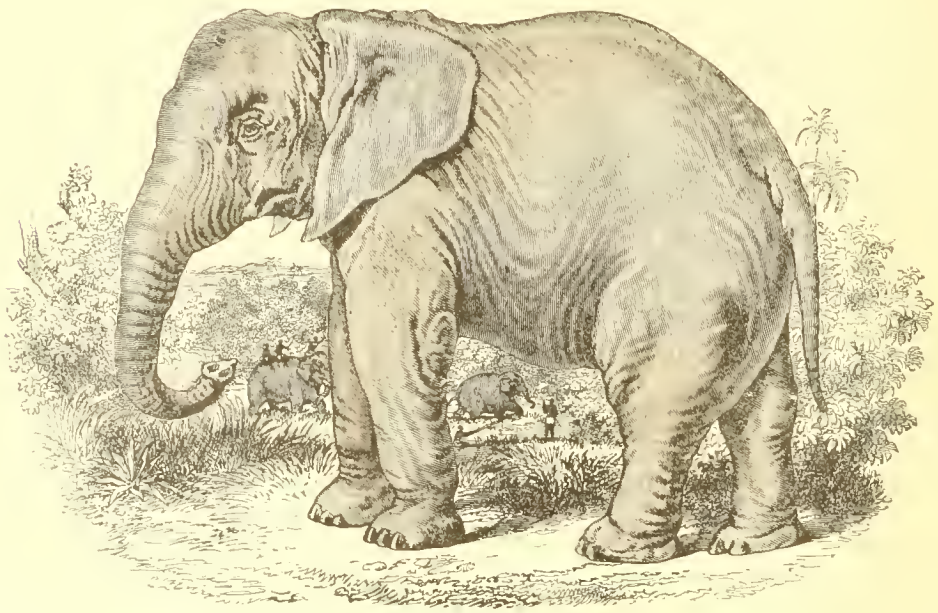


FIG. 3. — AFRICAN ELEPHANT.

But the elephant is naturally a gentle, kind animal and does not usually injure very seriously even an enemy, except in self-defense, or when very much enraged.

He sometimes fills his trunk with water and squirts it over his body to cool himself. With it he can in the same way throw dust over his back and sides to keep off insects.

When very warm and annoyed by flies, he occasionally takes a branch of a tree and fans himself. With his trunk he makes a peculiar sound called trumpeting, because it is a shrill tone something like the blast of a trumpet. The elephant is aware

of the importance of his trunk and when he is in danger raises it high above his head to keep it out of harm's way. He does this when hunting the tiger, so that it may not be injured by that animal.

Age. — Elephants reach a great age. It is supposed that they live to be a hundred and fifty or two hundred years old.

Kind of Animal. — The elephant nurses its young, and is therefore a mammal. It has five toes on each foot, instead of two, as the camel has, some of these are protected by hoofs, so he might be called an ungulate, and he is sometimes so called, but more often another name, on account of his proboscis is given him. He is called a pro-bos-cid-ian.

Kinds of Elephants. — There are two kinds, the African, so called because he lives in Africa and the Indian found in Asia. They are very much alike except that the African is the larger and has monstrous ears (Fig. 3) which reach below the head. They are sometimes five feet long and four feet wide, and are used by the natives for shields. Both males and females have tusks, while the Indian female does not. Four of the toes on each front foot and three on each back foot are provided with hoofs; Indian elephants have hoofs on all the front toes and on four toes of each back foot. Jumbo was an African elephant, as can be seen by his picture. His tusks were just beginning to grow when he was killed. (Fig. 1).

Where Found.— The elephant is a great eater. For this reason he must be where food is abundant. Jumbo ate each day two hundred pounds of hay, sixty-four quarts of oats, a barrel of potatoes, ten or fifteen large loaves of bread and several quarts of onions, besides all the cake and peanuts the children gave him. A large elephant drinks between two and three barrels of water daily. They also take frequent baths. You see then that elephants must live where there is plenty of water and an abundant vegetation. It is very warm and rains a great deal within the tropics. For this reason plants grow fast and large there. The elephant, like the camel, finds his home in the Old World, but nearer the equator, in the forests and jungles, south of the desert regions. The African is found everywhere in the interior of the continent where there is food for him. He used to live as far south as Cape Colony, but has been driven from that section by white men. The Indian elephant is found (see map) in India, Burmah, Siam and the Islands of Ceylon, Sumatra and Borneo.

Character of the Elephant.— The elephant, unlike the camel, is docile and patient. He becomes attached to man. Jumbo was never happier than when a dozen children were upon his back and he was giving them a ride. Of course elephants are sometime cross and dangerous, but so are dogs and cows. They are likely to grow ugly with age. In such cases, their masters keep them in subjection by prodding them That is, they tie the elephants up and goad them with a sharp pointed instrument called a prod. The elephant bears it as long as he can. When he finally decides to submit and be good, he gives a kind of squeal which is his way of saying that he gives in. He will then behave quite well for a time.

Uses of the Elephant.— An animal so strong, so gentle and so easily trained is very serviceable to man. Formerly both the African and the Indian elephant were tamed, but now the Indian elephant only is domesticated. Attached to a plow he will do the work of twenty oxen. There is one difficulty, however. He is such an enormous eater that it costs a great deal to keep him. As he can lift heavy weights, he is employed in making bridges and in the erection of large buildings. He is useful in carrying stores where roads have not been made, and for dragging artillery, and for piling timber, etc.

The African elephant is used for food by the natives. Except the trunk, the tongue, the heart, and the feet, his flesh is not considered very good eating by white people, but the negroes like it. He is especially valuable on account of his ivory, as his tusks are large, sometimes weighing 150 pounds. Ivory is worth rather more than a dollar a pound, so an elephant's tusks are very valuable.

It is said that 25,000 elephants are put to death every year for their tusks. Ivory is used for handles of knives and brushes and for ornaments. The Chinese make the most beautiful articles of it. The English use a great deal of it in the manufacture of knives.

Hunting the Elephant. — The Africans hunt the elephant in a rude way. Sometimes they dig a pit-fall in his path to some stream of water, and fasten a sharp-pointed stick at the bottom, which pierces him, and prevents his escape.

Sometimes the elephant-hunters, or aggageers, of the Hamran tribe in Africa use swords for killing elephants. They follow the tracks of the animal, so as to arrive at their game between the hours of 10 and 12 A. M., at which time it is either asleep or extremely listless, and easy to approach. Should they discover the animal asleep, one of the hunters would creep stealthily towards the head, and with one blow sever the trunk while stretched upon the ground; in which case the elephant would start upon his feet, while the hunters escaped in the confusion of the moment. The trunk severed would cause a loss of blood sufficient to insure the death of the elephant within about an hour.

Elephants are usually found in herds of from ten to thirty, led by one old elephant called the patriarch, which directs them and defends them. The East Indians sometimes spend several weeks in capturing a herd. Around an open place in the jungle they build a high, strong fence of bamboo with one small opening in it. Surrounding the herd, they gradually drive them into the path leading up to this enclosure. In this way they are assisted by the tame elephants, which coax the wild elephants into these pathways.

BLACK-BOARD OUTLINES.

SUGGESTIONS.

a. With the aid of pictures, all under "matter," except the illustrative stories, can be taught by questions. If possible, draw upon the board those that you can represent easily; and use others found in books. (You can get a stencil of an elephant.) If you have not a piece of ivory, some child in the school may be able to procure a specimen for the class to see.

b. If the children are much interested and you have time to do so, follow this lesson with a short one upon extinct elephants, taking up especially the Mastodon and the remains of elephants found in our own country, the Mammoth; and the ivory of Siberia.

c. To make the exercise a profitable language lesson, let the children reproduce both orally and in writing.

— Elvira Carver.

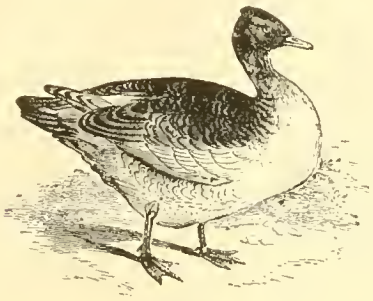
NOTES OF LESSON ON

SWIMMING BIRDS.

INTRODUCTION.— Show a drawing of some ducks, swans or other swimming birds.

Where Found.—Swimming birds are found in all parts of the world. There are many species which prefer cold countries, and migrate in summer time to colder regions.

Method.— Explain the words "*species*" and "*migrate*," and refer to the habits of the swallow.



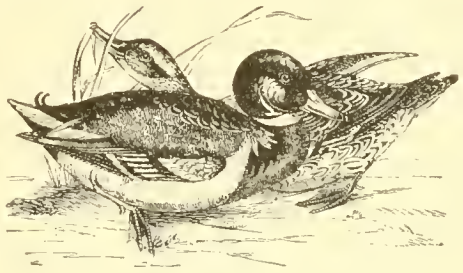
GOOSE.

Characteristics of Swimming Birds. — These are, *legs* placed far back on the body. *Feet* short, with webbed toes.

Covering consists of a very plentiful supply of feathers, saturated with oil and a thick coat of down next to the skin. *Bills* generally wide and flattish, also longer than their feet, to enable them to search for their food in the water upon which they swim. *Neck* in many instances long, *e. g.*, the swan.

Show how all the characteristics are necessary for their mode of living. Refer to drawings of the swan, duck, and other swimming birds. Show a duck's *foot* and *bill*. Children have seen a duck put its head under the water for food.

Kinds of Swimming Birds.— There are many kinds of swimmers, but we can only study a few now.



DUCKS.

Swans.— These are very elegant, with their long necks, beautiful feathers, and graceful swimming. They live chiefly on vegetable substances, and make rough nests with reeds, rushes and grasses, upon the banks at the side of the water. Their eggs are large, and of a dull, greenish white.

Geese.—The common gray goose is believed to have been domesticated from the European wild gray goose, or *Graylag*. There is also a beautiful species of white goose called the *snow-goose*, which is common in the Western United States in winter, and is a beautiful snowy-white, with the tips of the wings black, and the legs and bill red.

Ducks.— Some ducks have very pretty colored feathers. They live in this country, and are kept both for ornament and use.

USES.— For their flesh. For their feathers and down. For their eggs.

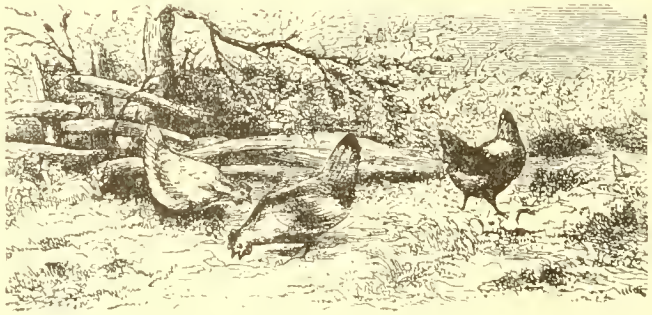
The Petrel and Sea-Gull.— These are sea-birds. They spend most of their time on the water, and prefer cold climates. They are found on our northern coasts. The Petrel or Stormy Petrel, as it is called, because its approach often foretells a storm, moves along on the top of the water, pattering with its webbed feet, and flapping its

wings. It received the name *Petrel* from the word Peter, because it walks on the sea. It is of a deep black color, with a few white feathers. It lays its eggs in a cleft of the rock, or in a rabbit burrow. It feeds on small fish, fat, or the refuse thrown from ships. It is often seen in *stormy* weather, because it can then easily secure its prey. As a means of defense it squirts oil in its assailant's face.

Questions.— Mention the names of some swimming birds. What is peculiar about their legs and feet that is not to be found in other birds?

Describe a swan; a duck. Are duck's eggs good to eat? Describe the snow-goose. What can you tell about the sea-gull? What bird spends most of its time on the water? From whence does it get its name?

Tell the story of the ugly duckling: how a swan was hatched by a duck, and was for a time despised by its foster-mother and brothers, but gradually it was transformed into a handsome swan.



NOTES OF LESSON ON

DOMESTIC FOWLS.

Introduction.— Call attention to a farmyard, and let children give the names of some animals kept in such a place. When they come to *fowls*, ask if any of the children have fowls at home. Show that we call those kept by people *domestic fowls*, just as we call our house-cat a domestic animal. The word *domestic* means belonging to the house. This class includes turkeys, geese, ducks and all birds which have the habit of scratching the ground in search of food.

Uses.— For Their Eggs.— These form a valuable diet, and if people have sufficient room to keep fowls, they will find that by careful attention to their food and houses they will secure a large profit.

For Their Flesh.— The flesh of young fowls is very sweet and tender.

For Their Feathers.— The small feathers may be used for stuffing pillows, etc.— The handsome feathers from the tail of the rooster are used to ornament hats.

Method.— Show some hen's eggs. Explain how nutritious they are. Ask who has tasted fowl, either boiled or roasted.

Description.— Among a number of fowls we notice the *rooster*, the *hens*, and the little *chickens*.

The Rooster is a handsome bird, with a very fine tail. He has his head crowned by a notched,

crimson, fleshy substance called a *comb*, and has two pendulous, fleshy bodies of the same color, hanging under his throat, called *wattles*. He is provided with a sharp horn or *spur* on the outside of his foot, with which he inflicts severe wounds.

The Hen is smaller than the rooster, and, except in the pure white breeds, less beautiful. She has a comb, but it is smaller, and less bright than that of the rooster.

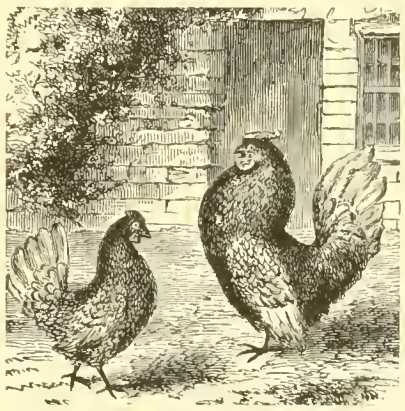
The Chickens.— These are the babies. They come out of eggs, which the hen lays and sits upon. Her warmth brings the chickens to life, when they break their shells with their beaks, and come out. They have no feathers at first, but are covered with soft, yellow down. They follow their mother, who finds them food, and run under her wings for safety when they are frightened.

Method.— If possible show a large picture of each bird, and let children thoroughly examine it, noticing particularly the points mentioned. Show that this class of birds is distinguished by having a rounded, heavy body, covered with loose feathers, which sometimes on the neck assume the character of plumes; the wings are short, round, and concave underneath. These are not nearly so useful for locomotion as the legs; for short distances they fly tolerably well, but are more at home on the ground. The legs are very strong and firm and the tendons of the muscles are of a bony nature. The structure of the beak should be noticed, and a real foot and beak should be shown.

Describe the claws, which are extremely hard, and particularly suited to the bird's mode of living, enabling it to dig and scratch up the earth in search of its food, which consists principally of seeds, roots and insects.

Habits.— Houses. — Some fowls are very valuable, and great care is taken in raising them. They must have a warm, dry, well-ventilated house. It must be provided with shelves furnished with baskets or boxes formed along the walls. These should be lined with straw ready to receive the eggs and form the nests. The house must have a yard or run attached to it, where the fowls may get air and exercise during the day. The floor of both house and yard must be kept dry and clean. The house must contain perches.

Food.— Fowls must be well fed. In farmyards they can run freely about, and pick up for themselves, requiring then only a little hand-feeding. Waste house-scraps may be mixed with their grain. They must have fresh green vegetables, as grass, cabbages, etc., also some mortar or shell rubbish, from which egg shells are made.



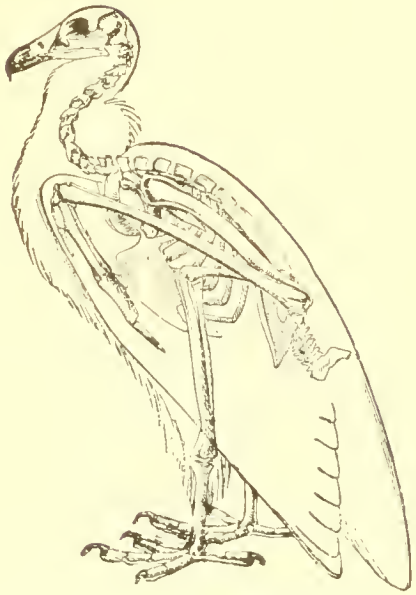
ROOSTER AND HEN

Character.— The rooster is very courageous; he struts about at the head of the hens as though ready to protect them from danger. The hen is generally timid, but when she has a brood of chickens will fiercely attack any enemy. She takes great care of her little ones.

Questions.— What is the meaning of the word *domestic?* Why do people keep fowls? What are they good for? What are the young fowls called? For what are fowls' feathers used? How do the chickens look when they first come from the shell? Tell about some chickens you have seen. How does the hen differ from the rooster? What do fowls require for food? Can they fly well? Describe the claws? Give some other description of their habits.

NOTES OF LESSON ON

BIRDS.



-Skeleton of Vulture.

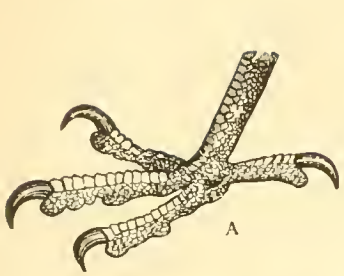
I.—The Skeleton.

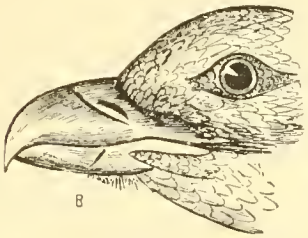
SHOW from an illustration that the bones of the leg of a bird are arranged on the same plan as those of mammals, but in a considerably modified form. We find a *thigh* bone and *two leg* bones always present, though the smaller of the two latter is often but imperfectly developed. Then, in place of the ankle and foot bones, there is a single long bone called the *tarsus*. To the tarsus, which is commonly looked upon as the leg-bone, the toes are joined. The *toes* vary in number and arrangement, and in the number of joints in each. Generally there are *four*, of which *three* are in *front*, and *one behind*. (The ordinary position of the toes may be shown from the leg of a hen).

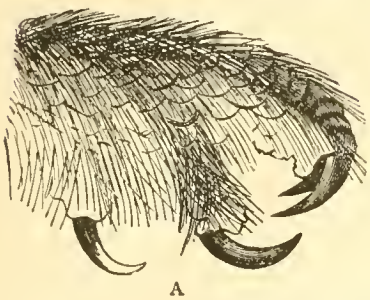
II.—How Birds Perch.—The special arrangement, by which most birds can sit and sleep on a branch or twig, is the most interesting and striking peculiarity in the structure of the bird's leg. All children will have seen how a canary *clasps* its perch with its toes, and will know in what position the bird sleeps. A boy can balance himself sitting on a branch, and he may "hold on" to secure his seat: but should he fall asleep he would be certain to get a fall of another kind. But when a bird sits down on a branch to feed, to rest, or to sleep, it cannot fall off if it would. The very act of sitting down makes the toes clasp the branch, whether the bird wills it or not. The arrangement is this: a flat, ribbon-like cord passes from a large muscle of the thigh over the knee-joint, and then winds over to the back of the leg, being kept in its place by a small muscular ring. It then passes down behind the leg bone, and over the back part of the joint of the leg bone with the tarsus, where it passes through a second muscular ring. It continues along the back of the tarsus to the junction of the toes, and then divides into cords which pass along under the toes.

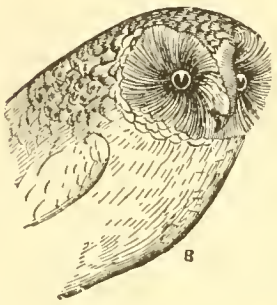
By this arrangement, when the joints are bent as they are when the bird sits down, or when it raises its foot in walking, the cord is stretched, or pulled, and the toes are made to grasp without any effort on the part of the bird. The teacher may show this from the illustration, but a far more instructive illustration will be to show the actual working of the cords in the leg itself. Take a fowl's leg. Cut through the skin at the joint between the tarsus and the leg, and dislocate the joint with the point of the knife; a small pull will break the cord at its junction with the muscle in the thigh, and it will be drawn out as a soft, thick, but very strong white ribbon. Pull this cord, and the toes will close as if grasping.

Advantage may be taken of the specimen to show the scaly covering of the leg.



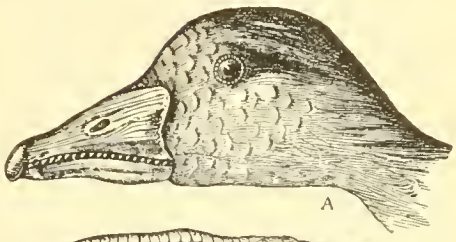


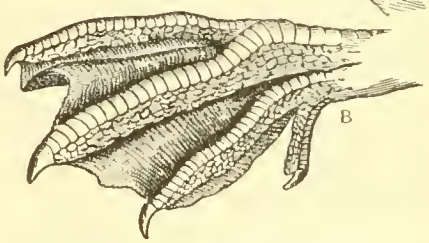




Head and Foot of Owl.

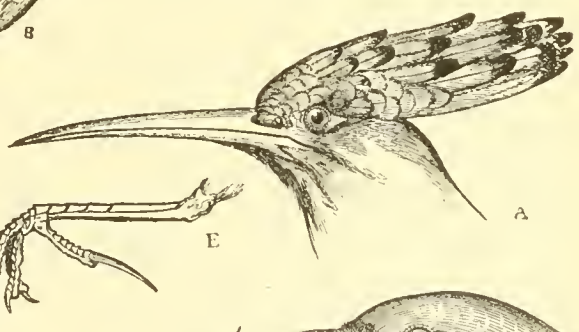
BIRDS OF PREY.

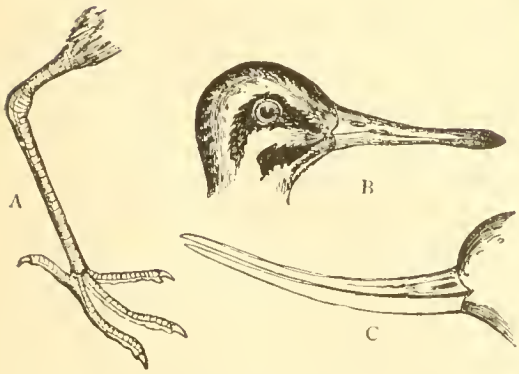


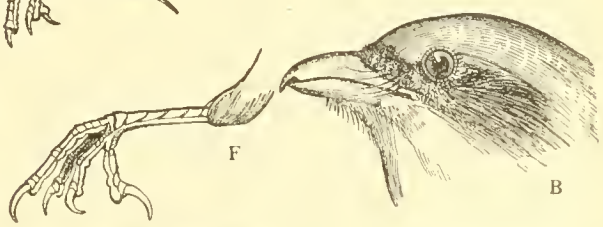


a. Head of Gray Goose. b. Foot of Domestic Goose.

SWIMMING BIRDS.

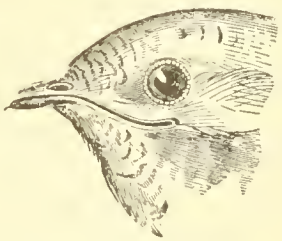






a. Leg and Foot of Curlew. b. Head of Snipe
c. Beak of Avocet.

WADING BIRDS.



a. Head of Hoopoe.
b. Head of Red-backed Shrike.
c. Head of Swift-bellied Swift.
d. Head of Corn bunting
e. Foot of the Yellow Wagtail.
f. Foot of a Finch.

PERCHERS.

III.— Special Uses and Modifications in Structure.— We have now to consider the different duties which the legs have to perform, and the consequent changes in structure. All are used more or less in walking, hopping, or running: very many are used as supports during rest and sleep, and not a few are used as hands to hold the food while the beak cuts or tears it in pieces. (Refer to the black-bird, with an earth-worm, canary, with chick-weed, parrot, with nut, etc).

At the same time the special structure of the legs and feet of birds for special duties are sufficiently marked to enable us to arrange the birds in groups accordingly. Thus we have *Seizers*, like the eagle, *Perchers*, like the robin, *Climbers*, like the parrot, *Scratchers*, like the fowl, *Runners*, like the ostrich, *Waders*, like the heron, and *Swimmers*, like the duck.

LEGS AND FEET OF BIRDS.

I.— Seizers.—"Birds of Prey."— In this group the legs are strong, and the toes are furnished with strong, curved, and sharply-pointed claws, specially adapted for the capture of living prey of considerable size. The vulture, eagles, hawks and owls are all "birds of prey." The members of this group have four toes — three before and one behind; but the owls can place the outer toe of the three either in front or behind.

II.— Perchers.— This group includes the vast majority of the small birds which live in this country. They are also called *passeres* (*passer*, a sparrow). These birds for the most part spend the greater portion of their lives among the branches of trees, on which they perch, and hop from twig to twig. Their feet are specially constructed for this purpose. The toes are usually three in front and one behind, and the claws are sharp, but long and slender, and of sufficient strength to secure the bird firmly to its perch.

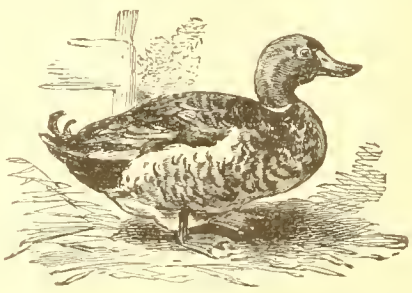
III.— Climbers.— All the birds in this group have *two toes before* and *two behind*. This enables them to cling with great tenacity to the branches of trees, or to climb up the perpendicular tree trunk. Parrots and woodpeckers are the chief examples of the group. Parrots climb rather by *clasping* small branches. Woodpeckers run over the bark of the tree trunk, and larger branches, in every direction by inserting their strong, sharp claws into any irregularities of the surface.

IV.— Scratchers.— Chiefly fowl and game birds. Show the leg of the fowl again in illustration, and point out that the legs of scratchers are strong, the toes rather short and thick, and the claws stout and strong and fit for scratching over the surface of the ground in search of food.

V.— Runners.— These birds depend entirely on their legs for locomotion, hence they are long, stout and strong. They never perch and few toes are required. In the ostrich they are reduced to *two*, and in the emu to *three*, and they are all pointed forwards. (The teacher may here refer to the speed of the ostrich, to an ostrich hunt, and to its manner of defending itself by kicking forwards).

VI.— Waders; or Stilt-Walkers.— These birds, of which the heron and crane are familiar examples, *wade* into the water after the food on which they feed, hence their legs are of unusual length. The length of leg has won them the title of stilt-walkers.

VII.— Swimmers.— This group includes geese, ducks, and sea-birds generally. The feet are specially constructed for swimming. (Show duck's foot). The legs are short and strong and placed far back on the body, and the toes are united by a stout membrane — the web.



NOTES OF LESSON ON

THE EAGLE.

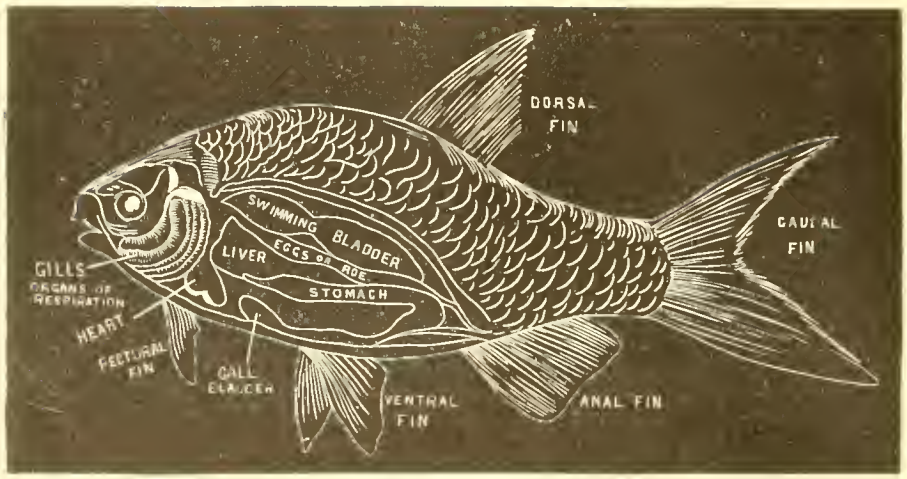
ITS GENERAL APPEARANCE.— Show a picture or drawing of the eagle. By questions and statement set forth a clear and vivid *general description* of the bird. Its *great size;* the largest measuring three feet in length, and nine feet from tip to tip of the outstretched wings. Show these measurements clearly on table or large black-board, or the floor. Illustrate by comparison with size of the swan. Less bulky in body, but with larger stretch of wing and tail. It is one of the very largest flying birds. *Its beak*, curved, very strong and sharp, with a wide-stretching mouth; its *talons* or *claws*, four: three in front, one behind, sharp, very strong and curved. Its *eyes* bright, bold-looking, and large; its spreading *wings* and *tail*, the beautiful covering of *feathers*; large on wing and tail, smaller on body, all of them rich in color; different colors — brown, reddish, gray, white, black, golden-colored; making a soft, warm, light clothing for it.

Where, and How, The Eagle Lives.— THE EAGLE'S HOME.— Children who live in towns or where many people live together do not see eagles, unless it is one which has been caught and shut up in a cage. They live far away, where few people go; generally, where there are high hills, and great forests, or tall sea-cliffs. It usually makes its home on the top of a mountain. What is the home of a bird called? Describe the eagle's *nest*. Perched on the top of a high rock, reached only by a long, weary climb over rocks and hills, not often looked into by the eye of any man. *What made of?* Small branches of trees and bushes put loosely together. There the mother bird lays two or three large eggs; from these come the young, called *eaglets*. On a ledge of rock near may be seen the bones of *other birds*, even a *lamb*, or young *deer*. How came these there? They are the bones of creatures caught by the parent birds, and brought to the young as food. *The eagle is a bird of prey.* No other nest is near. No bird or animal lives near it. Even a man is in danger who goes near it. The eagle flies fiercely upon its foe, and strips and tears with its sharp talons and beak.

How The Eagle Gets Its Food.— Describe vividly the starting upwards from the mountain-top, rising high in the air, the circling flight, till almost out of sight, looking like a speck, though so large. But why does it fly so high? Can it find food there? No; but it can see over a wider space of ground, and so be better able to see where its prey is. Explain and illustrate how this is. But that it may see at such a distance, what kind of eyes must it have? Speak of its *keen, piercing sight*. Then how can it reach what it sees? Small animals run quickly out of sight; birds fly quickly away. Speak of the eagle's swift flight, the sudden drop, as of a stone out of the air. How does it seize its prey? The sharp talons; the strong, firm grip, the upward, darting flight should all be described.

Let questions of revision bring out the several points of structure which have been taught, and how they affect the eagle's habits; the swift strong wings; where they take the bird; why it goes there; the keen, piercing sight; the strong, sharp curved beak; etc.

Kinds of Eagles.— Eagles are of different sizes and kinds. The largest and finest is the *Golden Eagle*, so called because of the rich golden color of many of its feathers. Another is the *Sea Eagle* (Osprey). It lives on hills and cliffs near the sea and catches fish. It sees the fish swimming near the top of the water and drops down upon it from its great height in the air.



A BLACK-BOARD SKETCH.

FISHES.

[Illustrate with pictures, a dead specimen, and, if possible, a live specimen in water — a gold fish, for instance].

I.— INTRODUCTION.

FISHES are inhabitants of the water, either fresh water or salt. Here they are born, here they live, and here they die. They are not, however, scattered without order or arrangement; on the contrary, just as in the case of land animals, their instincts lead them to make a home in that part best adapted to their well-being. Some live near the surface of the ocean, others never quit the depths; some revel on the sandy floor, others grovel in the ooze and mud; some never quit the salt water, others spend a portion of their time in the waters of rivers; some are altogether fresh-water fish. We find similar habits of life, too, in the water as on land; some fish live in solitude, others in shoals; some occupy the same locality all the year; others in vast numbers migrate from one part to another.

The typical form of a fish is well known, but we find other and curious shapes. Some fish are round as globes, others are flat as boards; some are as broad as long, others are long and thin, with scarcely a difference in thickness throughout.

The body is usually covered with scales, and these are of all shapes, sizes and colors. They vary in size from a point to a plate; and in color from the dullest shades to the brightest hues of the rainbow.

Fishes feed on succulent marine vegetables; on worms and shell fish, but mostly they devour other fish. In the sea, might is right; the great ones eat the small, and the strong devour the weak. They have no respect for even their own kindred.

It will be impossible for us to consider the variations in form and structure of the vast multitude of fishes. It will be sufficient for us to take a common example — the Codfish or Mackerel — to show how beautifully fishes are fitted for the watery element in which they live. We shall first ask and answer four questions — *How do fishes move? How are they protected? How do they breathe? How do they feed?* And it will be convenient to answer the first two in this lesson.

II.— HOW DO FISHES MOVE?

1.— Shape of Body.

By actual experiment in a vessel of water, show that one *form* of body can be moved more easily through the water than another. Take a cone or a wedge of wood, for example, and pass through the water, first with the base forward and then with the point or edge. Show next that the body of the fish is shaped something like a pair of wedges set back-to-back; the hinder one coming almost to a point, but with the edges pared off. Refer to the shapes of boats, and elicit why they are so

shaped, and generally lead up to the proposition, that the body of the fish is so shaped that it can be moved through the water with the least possible amount of force.

2.— *The Tail and Fins.*

Make a black-board outline. The attention of the children should be drawn to the graceful sweep of the hinder half of the body and the tail from side to side, and the consequent motion forwards. Refer to the way in which a boatman propels his boat with a single oar placed over the stern of the boat. The boatman imitates the fish in this use of the scull.

The fins vary in number and position, but most fishes have *five* kinds. Just behind the head there is one pair; these correspond to the fore-limbs of mammals, and are called *Pectoral*, *viz:* breast fins. A second pair corresponds with the hind-limbs. These are the *Ventral*, *viz:* belly fins. In some fishes these are placed as far back as the tail, in others as far forward as the throat. Besides the *Caudal* or Tail fin, there are other fins placed perpendicularly along the upper and lower sides of the body. These are the *Dorsal* and *Anal* fins. With the exception of the *Caudal* fin, the chief use of the fins is for *balancing*. Cut off the fins and the fish rolls over on to its flat side. The fins are merely folds of the skin spread out, and strengthened and supported by bony spikes.

III.—THE COVERING OF FISHES.

The general covering of mammals is *hair*, that of birds, *feathers*, that of fishes consists of *scales*. The teacher will show the scales of any fish he may have secured. He will call attention to the way in which they are arranged on the body; how they overlap like shingles on a house, but from head to tail instead of from above downwards. The front edges of scales are embedded and held firmly in folds of the skin. The fish-dealer, to remove the scales, scrapes his knife from the tail to the head. By this means the knife gets under the free edge of the scales, and forces them off. The scales form a beautiful protecting skeleton, and at the same time admit of perfect freedom of motion. The slimy covering over the scales will next be brought under notice, with the purpose it serves; and lastly, the teacher may deal with any modifications in the scaly skeleton as time and opportunity offer.

IV.—HOW THEY BREATHE.

Explain to the children first of all what is the real essence and object of breathing, *viz:* getting fresh air in contact with vessels containing the blood, so that the oxygen may get in through the walls, and the impure air may come out. The blood must thus be cleansed or the animal dies. The larger land animals take air into *lungs* or *sacs*, the walls of which are covered with blood-vessels, and the exchange of pure for impure air is thus made. But fishes living beneath the surface of the water cannot make the exchange in this way. All natural water contains a certain amount of air, and it is this air which the fish has to take out. When water is boiled this air is driven out, and if a fish be placed in water lately boiled, it turns over on its side and dies without a struggle. Its blood-vessels are arranged on a bunch of leaflets placed on each side of the head — the gills; and over these gills the water is constantly flowing. The gills may be called the lungs of fishes, because they have to serve the same purposes.

Show the gills of a fish. They look like fringes. Under the microscope they are seen to be full of thin-walled blood-vessels. As the water flows over these blood-tubes, sufficient air passes through the thin walls from the water to the blood to keep the latter pure. Of course, at the same time, the impure air escapes into the water. When a fish is taken from the water the gills shrink and fall together and become dry; and the fish dies because its gills cannot do their work. The fish is, in fact, suffocated for want of air, just as much as a mouse would be suffocated if held under water. Both die for want of the necessary air.

If we watch a fish we see that it appears to be constantly drinking. This is not so, however. The water, it is true, is taken into the mouth, but it is passed back over the gills and out through

the holes at the sides. The throat is closed meanwhile, and no water enters the stomach.

V.—HOW FISHES FEED.

To learn how fishes feed we may look at the mouth, the teeth, the tongue and the lips. The lips are horny, and hence there can be little or no sense of feeling. The tongue is also immovable, and often bony or beset with bony plates, hence the sense of taste can be but slight. The teeth are very variable in number, form and position; but, for the most part, they are simple conical spikes with the points bent backwards towards the throat. These teeth are suitable for seizing and holding, and not for chewing. We may learn, therefore, by a simple inspection of the mouth, that fishes mostly catch their prey alive, and swallow it whole.

VI.—SPECIMEN FISH.

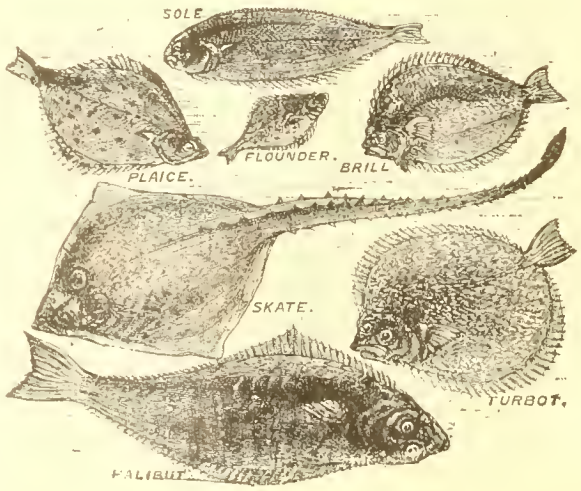
The teacher should now direct attention to any peculiarities in structure and habit of such common fish as are within his reach. We take two illustrations, a Flat Fish and Eel.

1.—Flat Fish.

Most people imagine that the dark side of a *flat* fish is the back and the light side the belly; but really these fish are compressed sideways like the herring, only to a greater extent. Then both eyes are on the dark side, but when quite young the eyes were on both sides. As the animal grows, one eye works round to the same side as the other. If we look at the fish at home these peculiarities in structure would be explained at once. Flat fishes spend much of their time either resting on, or partially covered by, the sand or mud at the bottom of the water; and the color of the fish so much resembles the floor on which it rests that it is not easily distinguished. Again, resting on the mud or sand, an eye on the lower side would be worse than useless. Dorsal and ventral fins extend quite along the body from head to tail. The scales are very small, and so are the teeth.

2.— Eels.

This fish takes the shape of a snake. It looks and feels as if it had no scales. It has, however, a vast quantity, though so small as to be almost invisible. Eels are very slimy fish and difficult to hold. The chief peculiarity in the eels, besides their shape, is the arrangement of the gills. Instead of the opening of the gills for the exit of water being close at hand, it is placed far back, and consists of but a small hole. When this hole is closed the fish can keep its gills moist for some time, and thus live out of water. In fact it occasionally happens that when one piece of water is pretty well dried up eels migrate to another place, creeping over the ground like snakes. Eels pass the winter in a torpid state in the mud.



FROGS.

NOTES OF LESSON ON

THE CLAM AND THE OYSTER.

[The salt-water round clam or quahog is taken as the illustration for this lesson merely because in my experience it has been easiest to get. If you find the long clam more accessible, or living in land the fresh-water clam, use that, but by all means have actual specimens of some sort. To show the action of the siphon in the living fresh-water animal use a shallow dish of any kind, put the specimens into it and add enough water to cover. After a period of quiet you will see the "foot" and the siphon extended. Now drop a little ink or bluing carefully near the extended siphon and watch the currents. To show this with the other clams you must of course put them into sea water.

The parts of the body are not so easy to make out when one has not already had some practice at dissection but by doing the work under water (which floats the membranes apart and so renders them more easily studied), following the description and the illustrations, no difficulty will probably be felt in making out the chief points mentioned.]

The Shell—Valves.— The most striking part of the clam is not the animal but the shell, the house in which the animal lives and so we will look at that first. When cleaned it is white, somewhat convex and consists of two equal parts which are hinged together at one side and when freshly taken from the animal these two parts can be closed by pressing them together in the hands, but on removing the pressure they again fly open.

These are the doors, or *valves*, as they are called, of the house and because there are two of them the shell is a *bi-valve*, a term used for all similar shells and also applied to the animals which make and inhabit them.

Ligament.— Examining the hinged side we notice fastened to it a dark brownish, very tough substance known as the *ligament*. When this is cut, which is not easy to do — or torn — readily done when thoroughly dry — the valves no longer fly open. This ligament then must be a sort of spring put there not to shut but to open the valves and so the shell of our clam may be likened to a house without windows but with doors intended to stay open by means of a spring. (In the so-called long clam this ligament corresponds in position and action to a piece of strong rubber put between the two parts of the hinge of an ordinary door which is compressed by the shutting of the door and forces the door open on removing the pressure. See if it holds a like position in the round clam or in the fresh-water clam.)

Lines of Growth.— Look now at the outside of either valve and notice a series of lines, parallel with the gracefully curved free edge of the valve and hence one within another (concentric). (Feel of the shell then see what it is that makes it rough). These concentric lines are *lines of growth* each one was once the edge of the shell and as the animal grew it added another and another line of matter so as to keep room for itself inside.

Muscle-scars;— Pallial Line.— Look next at the inside of a valve. Along the edge is a rather broad glossy purplish band with a slight depression at the right and another at the left. These are the *muscle-scars* and each marks the place where a muscle was fastened, the use of which was to shut the shell. (See Fig. 1).

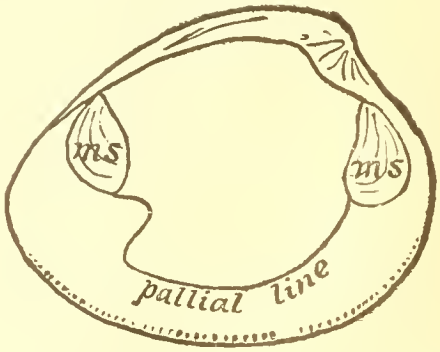


FIG. 1.

The line marking the inner edge of the purplish band is the *pallial line*; to this was attached the part of the animal called the mantle.

Inside of this line the rest of the shell is a chalky white.

Material of the Shell.— Put next a drop of muriatic acid on the shell as you did in the case of the sea-urchin and the coral and observe whether the same effect is produced. What is the material of which the shell is made?

Gills.— At *g* are two thin folds of membrane marked with fine parallel ridges and lying one above the other. By means of these the clam breathes. Special organs for breathing the air contained in water are called gills. These are the clam's *Gills*.

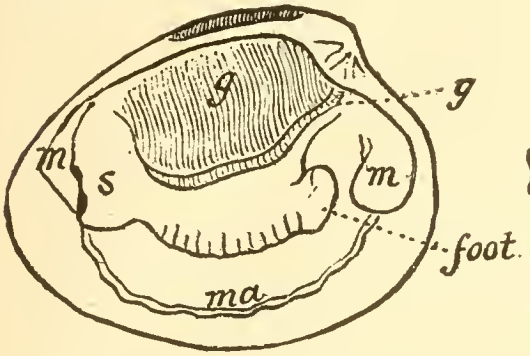


FIG. 2.— RIGHT VALVE WITH MANTLE REMOVED.

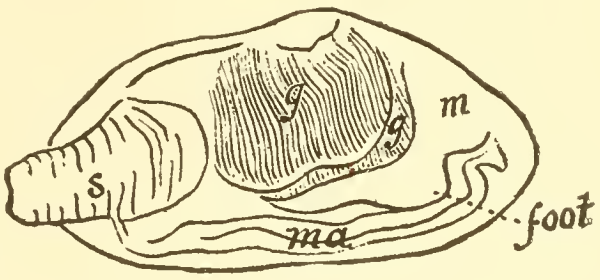


FIG. 3.

The Animal — the Mantle.— Put a live clam into hot water for a short time. Then with the aid of a strong knife you can pry open the valves and running the point of the knife carefully along the inside of one valve separate it from the animal. Lifting off the now separated valve we find a thin membrane, which lined the valve and was fastened to the pallial line. This membrane is the *mantle*, and its use is to make and repair the shell. Cutting this carefully away, we have something like Fig. 2.

Adductor Muscles — Siphon.— At each side (*m*) the cut end of the pinkish muscle which by its shortening shuts the valve. These are the *adductor muscles*, the scars of which we before noticed on the inside of the valve.

On the left side (*s*) a fleshy part, capable of considerable extension and having two openings directed toward the left. This is the *siphon*. It is much more prominent in the long clam (Fig. 3). Through the larger of the openings, water with floating bits of food is taken in by the clam and through the other opening the water is again discharged.

Body-"foot."— Lifting up the two gills we see the thick body of the clam, the lower right-hand portion of which can be extended out of the shell as a tongue-shaped mass, and being used to move the animal about in the sand or mud in which it lives it is called the "*foot*." Lifting up the body next we find under that two gills similar to the two already observed and beneath them, lining the still attached valve (*ma*, Fig. 2) the other part of the mantle, showing its thickened, dark-colored and ruffed outer edge.

The Oyster.— Compare now the shell of the oyster with that of the clam and note that the two valves are not alike in size, one, larger and deeper than the other, is the lower or left valve and generally bears marks on the outside of having been attached to something; the other, smaller and flatter, is of course the upper or right valve. There is but one muscle-scar, instead of two as in the clam.

Comparing the animals, notice the mantle and the gills. There is no siphon, and no foot. The dark portion toward the hinge contains the stomach and liver,— the blackish part being mainly liver. Near it is also the mouth, difficult, however, to find.

Structure.— Compared with the animals we have studied before, we notice that the clam and the oyster are not made up of ring-like parts, nor of parts radiating from a centre, but that they are soft-bodied animals enveloped in a bag-like "mantle" and inclosed in a hard, limy shell. Such animals are called Mollusks or Mollusca, and those mollusks having the thin leaf-like gills, as the oyster and clam, are known by the long name of *Lomellibranchs* which means, very nearly, leaf-gills. Because they have no distinct head they are also sometimes called in the books *Acephals*, meaning headless, but because of the two parts to the shell it may be easier to remember them simply as *bivalves*.

Kinds of Mollusks.—There are about 20,000 different kinds of Mollusks of which number about 5000 are bi-valves. The latter range from tiny shells to the giant clam Tridacna, sometimes five feet across, the shell alone weighing nearly five hundred pounds. Some are fixed permanently to one place like the oyster; others, as the clam, move slowly about, still others as the scallop, with considerable rapidity. Some bore into solid rock, others, as the so-called "ship-worm" which is not a worm, bore into wood.

Besides the oyster and clam, the pecten or scallop, and the mussel are common in the markets of our sea-port cities.

Where Found.—Bivalves, and so of course Mollusks, of some sort, are found almost everywhere in fresh and in salt water, but chiefly in the latter and as a rule in not very deep water.

Uses.— The oyster, clam, scallop, and mussel are used for food, the first especially being cultivated for this purpose. In July and August the oyster lays its eggs and the young swim about for a time after hatching before they fasten themselves to objects on the bottom. In from two to four years they are ready for market, and are gathered by being scraped from the bottom with a dredge.

The clam is also used for bait. Among other bivalves the pearl-oyster yields the valued pearls. Pearls are often formed in the common oyster, the clam, and the fresh-water clam, those from the last-named having sometimes a money value which is not true of the others. These pearls are formed by grains of sand or other particles getting between the mantle and the shell and there being covered with the substance which the mantle secretes. The shells of certain bivalves furnish us with the material called mother-of-pearl used in making buttons, knife-handles and inlaid work, while the shells of all mollusks can be, and of many are, "burned" for quicklime.

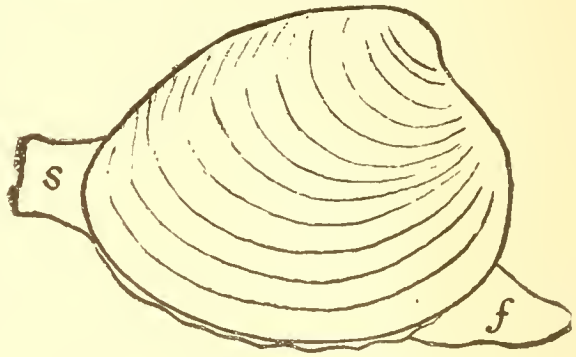


FIG. 4.—SIPHON (S) AND FOOT (F EXTENDED.

BLACK-BOARD OUTLINE

	CLAM.	OYSTER.
The Shell.	valves.	valves.
	ligament.	ligament.
	lines of growth.	lines of growth.
	muscle-scars (2).	muscle-scar.
	pallial line.	pallial line.
	material of shell.	material of shell.
The animal.	mantle.	mantle.
	adductor muscles.	adductor muscle.
	siphon.	——.
	gills.	gills.
	body.	body.
	foot.	——.
	structure.	structure.

Kinds of Mollusks. Where found. Uses.

Subjects for composition work will be suggested by the preceding lessons, which see. It will be well to have the descriptions largely comparative; the ability to recognize the same essential thing under different forms is of value to others besides naturalists, and one of the chief uses of the study of natural history after all is to open one's eyes and enable one to see things straight.

—F. W. STAEBNER.

NOTES OF LESSON ON

THE LOBSTER AND THE CRAB.

I. — THE LOBSTER.

LAY the lobster back up. Its color is dark greenish or greenish-black often mottled with reddish-yellow, but varying considerably in shade; after being boiled it is bright red. Scratch the outside with a pin or your finger-nail — you find it hard. Note that the body is long and nearly cylindrical. Observe two distinct parts commonly called "head" and "tail" respectively. The "head" is all one piece, but on it is a more or less plainly-marked groove running downwards and forwards each side from the back. All in front of this line is *head* and all back of it corresponds to the separate part we call *thorax*, when studying the bee. But since head and thorax are here merely divided by a curved line we call the piece *head-thorax*, or *cephalo-thorax*, meaning just the same thing. The "tail," made up of rings, is the *abdomen*. (Figs. 1 and 3).

Head-thorax. — In the middle line of the cephalo-thorax is a sharp projection extending forward beyond the body, the rostrum or beak. On either side of this at its base is a little movable stem or stalk with a rounded black spot on its end. This black spot is an eye, made up of many smaller eyes, therefore a *compound-eye*. The stalk supporting it is an *eye-stalk*. Under the eyes is a pair of long many-jointed *feelers* or *antennæ*, and in front of the eyes a similar pair of shorter antennæ or *antennules*, but while each antennæ is a single long, whip-like object, each antennule is forked so that there seems to be a pair on each side.

Looking now a little below the antennæ in front part of head-thorax and working toward the under side of the body, Figs. 2, 3, we find a pair of hard, tooth-like nippers, opening from side to side and touching when shut. These cut the food and are the *jaws* or *mandibles*. Between them is the *mouth*. Under them are two pairs of thin flaps lying close together which help the mandibles in preparing the food; they are the *lesser jaws* or *maxillæ*. Below these we find three pairs of organs which, especially the last pair — look a little like feet and yet also help in eating. They are the *jaw feet* or *maxillipeds*. (All these parts, mandibles to maxillipeds, are so closely laid against the body and so overlap that it is perhaps easier to examine them in reverse order beginning with the maxillipeds). Now we are quite on the under side of the body and have before us a pair of jointed limbs to which the great claws or pincers (*chelæ*) are attached. Following these are four more pairs much like those just described, yet each succeeding pair differing more and more from the first, but all plainly intended for walking, that is, all but the first, which bearing the great claws is rather a pair of weapons than feet, but all five pairs are commonly called *walking-feet*.

Lifting up the overlapping edge of each side of the cephalo-thorax we find attached to the bases of the legs a series of light-colored feathery parts each consisting of a stem and fringe of soft material. These are the *breathing-organs* or *gills*.

The lobster breathes air but he gets it out of the water. If you draw a tumbler of water and set it aside in a warm room, in an hour or less you will see on the inside of the glass tiny bubbles of air which have come from the water. All water naturally contains some air. A great many animals that live in water breathe by means of gills. Perhaps you know of some.

Abdomen. — Examining the abdomen we find it made up of six quite similar ring-like pieces or segments, and a differently shaped end piece called the *telson*. On the under side of the abdomen each ring bears a pair of flattish appendages used in swimming. These are the

LOBSTER (HOMARUS VULGARIS)

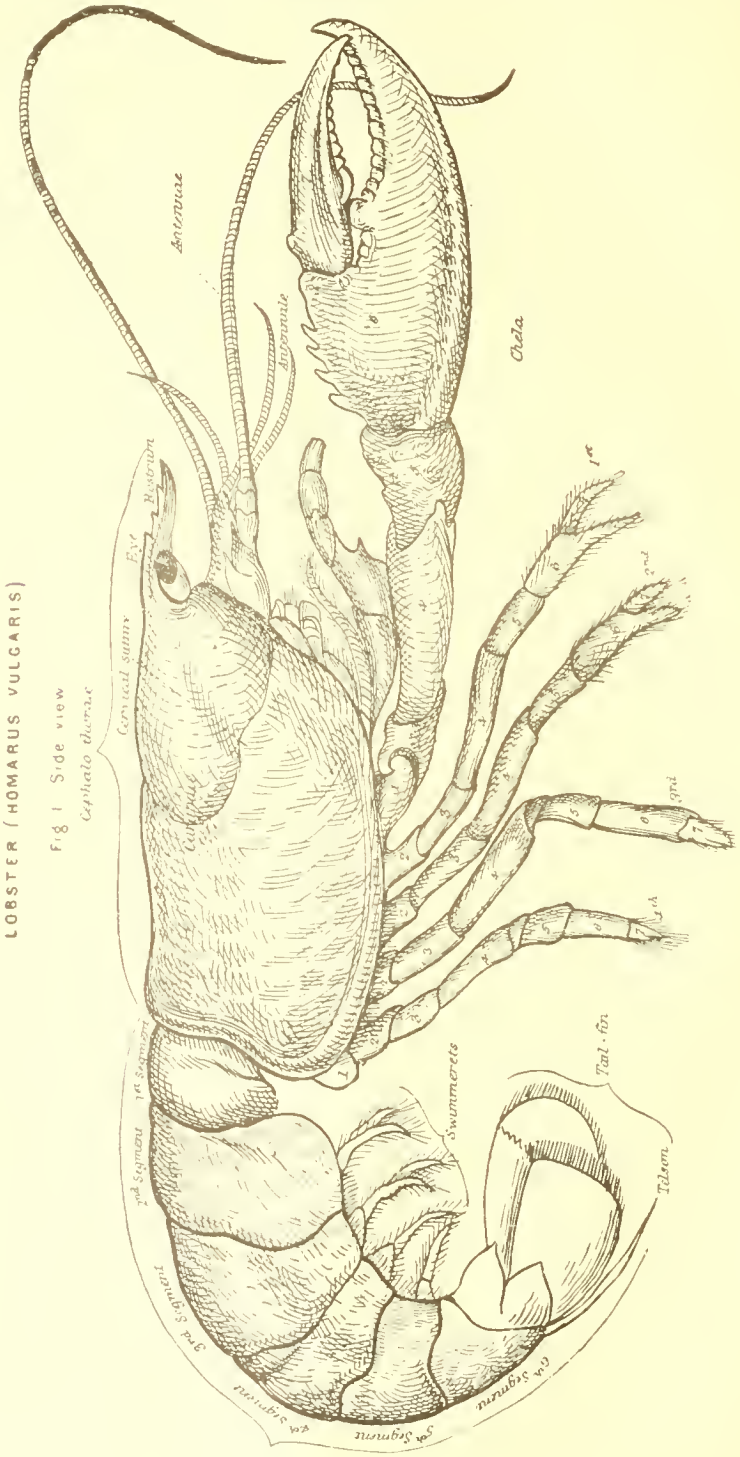


Fig 1 Side view

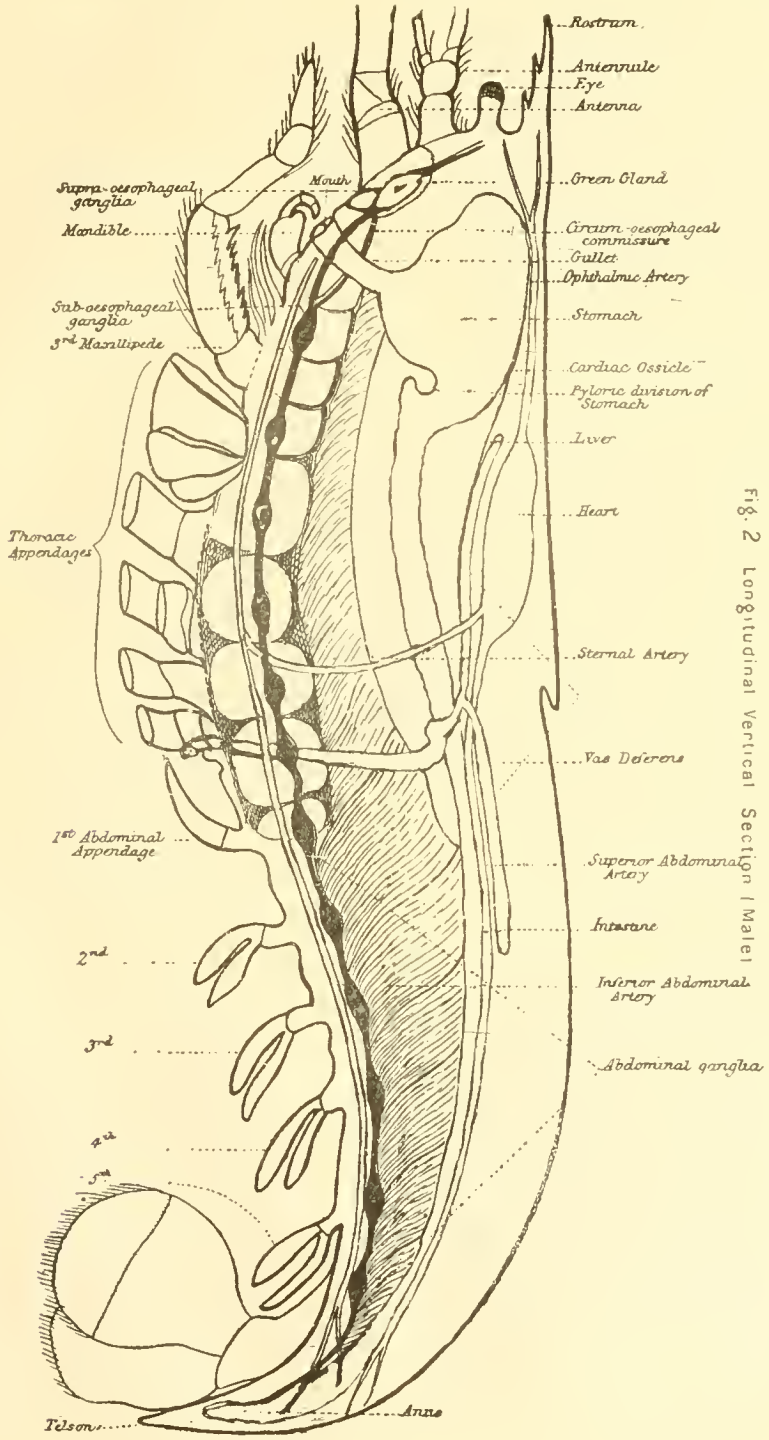


Fig. 2 Longitudinal Vertical Section (Male)

swimming-feet or *swimmerets*. The last pair of swimmerets is much larger and broader than any of the others, and each consists of two flaps which can be spread so as to form with the telson, a fan-shaped "tail-fin" with which the lobster can swim very swiftly backwards. (Fig. 3).

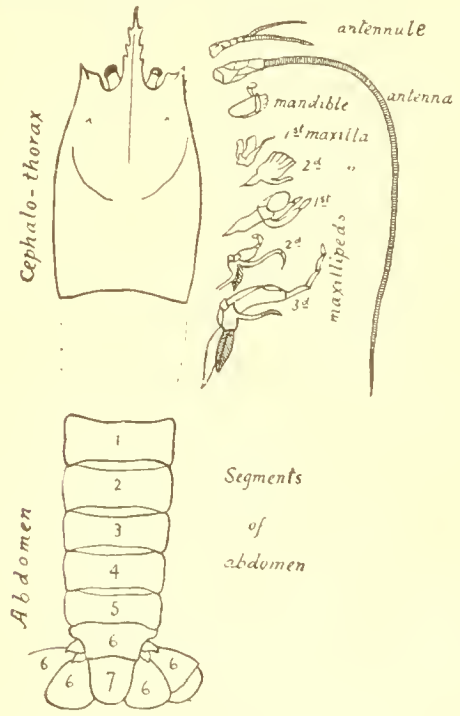


Fig. 3.

Internal Structure. — Some other curious things about the lobster you may like to know. The food torn by the jaws goes from the mouth through a short tube into the *stomach*, which is a soft bag stretched over a hard frame and contains teeth—*stomach* or *gastric-teeth*. You can readily find the stomach as it takes up the larger part of the forward end of the cephalo-thorax. (See Fig. 2). It is often called the "lady."

The *heart* lies inside the back along the middle line of the head-thorax, and forces the nearly *colorless blood* to different parts. The blood is gathered up along the under side of the body, and after passing through the gills, returns to the heart. A constant supply of water is made to wash the gills, partly by the motion of a little scoop, the *gill-bailer*, partly by the movements of the walking-feet to which we found the gills attached.

The *ear* is a little pit at the base of the antennules.

As the body of our lobster is composed of jointed pieces it belongs to the group of animals called Articulates, or, more commonly now because it also has jointed limbs, Arthropods or Arthropoda. As head and thorax are united and the whole outside is a hard crust it belongs to that division of Arthropods known as Crustacea or Crustaceans.

Where Found. — The lobster lives in the ocean near the coast, preferring rocky bottom, but also found where it is sandy or gravelly. Our lobster is common on the Atlantic coast from New Jersey northward.

Habits. — The lobster can swim rapidly backwards or forwards, and can also walk and climb under water. It eats other animals alive and dead, that is, it is carnivorous. When a limb is lost by accident another grows in its place. Lobsters hatch from eggs, which are little globular bodies, nearly black, and about as large as cabbage seeds, and which are attached in great numbers to the swimmerets of the mother chiefly in spring and early summer. As the lobster grows his hard coat gets too small for him, so at a certain time in warm weather the body loosens itself from its covering, this splits along the back, and the lobster pulls himself out. He has *moulted*. (What other animals moult?) The lobster is now soft, and to escape his enemies, who would be glad of such a tender morsel, he goes into hiding till his outside has again hardened. He moults often at first, but only once a year after he is full-grown.

Kinds of Lobsters. — There are many different kinds of lobster-like animals most of which live in the sea, but one sort lives in some rivers and lakes. This is the fresh water-lobster, crawfish or cray-fish, sometimes wrongly called crab.

— F. W STAEBNER.

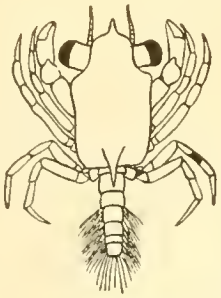


FIG. 2.—YOUNG-CRAB.

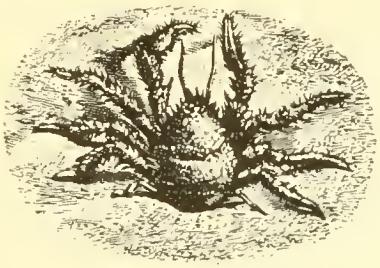


FIG. 5.—SPIDER-CRAB.

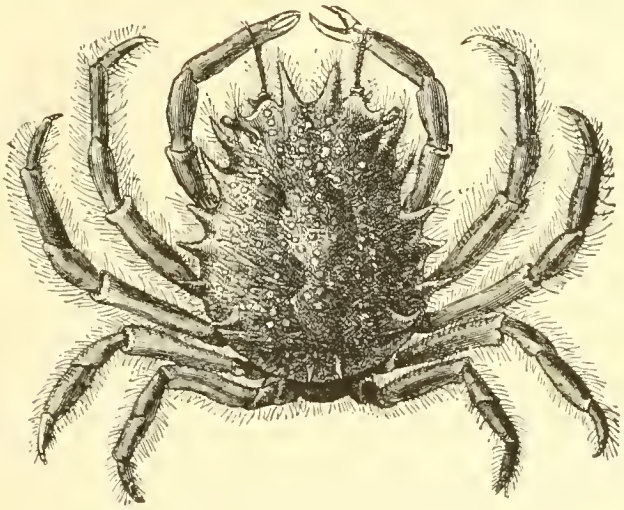


FIG. 3.—THORNBACK-CRAB.

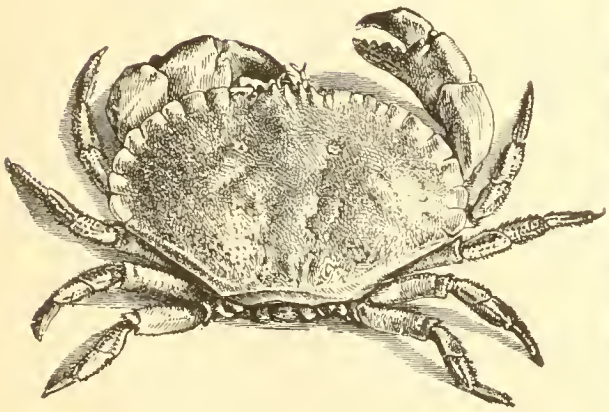


FIG. 1.—EDIBLE-CRAB OF EUROPE.

FIG. 4.—COMMON-CRAB.

NOTES OF LESSON ON

THE CRAB.—II.

THE crab at first sight looks very unlike a lobster. Holding it as in Fig. 1, we note that it is short and flattened, that its color is a dark green or bluish-green, and trying it with a thumb-nail we find it hard outside.

All the upper side is *cephalo-thorax*. Turn the crab over. Tightly pressed against the body, in a groove in which it snugly fits, is a jointed flap. Pulling it out you find it fastened at its broader end to the cephalo-thorax. This is the *abdomen*; count the number of pieces of which it consists. Then see how many of the following parts you can find.

pair	of stalked eyes	attached to cephalo-thorax.
"	" antennules	
"	" antennæ	
"	" mandibles	
2 pairs	" maxillæ	
3 "	" maxillipeds	
pair	" pincers	
4 pairs	" walking-feet	
6 "	" swimmerets attached to abdomen.	

We find the crab, although apparently so different, on the whole very much like the lobster. Animals that are like one another in structure we put together; those most alike being placed nearest together. This is called classifying. We have already classified the lobster. The crab, being like it in having the body made up of jointed pieces to which are fastened jointed appendages belongs to the same group *Arthropoda*, and because of its hard outer crust to the same division *Crustacea*.* The lobster and crab both having ten walking-feet belong to the same division of the Crustacea, the *Decapod*, or *ten-footed* Crustaceans Again, because of its seemingly shorter abdomen or "tail," the crab and others like it are called *Short-tailed* decapod cructaceans, while the lobster is put with the *Long-tailed* division.

You must not suppose it is always easy to classify animals. Some crabs, for example, you might not know whether to call long-tailed or short-tailed. In such cases the naturalist uses his judgment and puts them with those they most resemble in other respects. If you were told to take all the books out of a case and put the large ones in one pile and all the small ones in another, you might meet with some about which you would find it difficult to decide whether they ought to be called large or small, so you would have to use your judgment and put them with the pile they most resembled. Some one else might not agree with you in placing the doubtful books where you did. So small differences in animals bother naturalists very much, and they try to overcome the difficulty by proposing other arrangements, and this is one reason why you find such different classifications in different books.

Where Found.— Crabs are found mainly in the sea, in shallow water, but some live in fresh water and some, in the warmer regions of the globe, entirely on land. These latter, however, visit the water to lay their eggs.

Habits of Crabs.— Some crabs swim well, others poorly, but all can walk backward, forward or sideways, often very rapidly. Some climb well. Most crabs, perhaps all, eat animal matter of some sort, either attacking living animals or feeding on carrion; some eat mainly vegetable substances. Crabs, like lobsters, have the power of growing a new limb if one should be lost in any way. Crabs hatch from eggs which are carried on the swimmerets of the mother.

The young are at first very unlike the old, so unlike that some of them have been described as different animals. Animals which pass through

* The possession of the hard outer crust is not sufficient alone to distinguish Crustaceans since other Arthropods often have the outside of the body hard. Crustaceans must also have more than four pairs of locomotive organs, and two pairs of antennæ, and *then* there are exceptions.

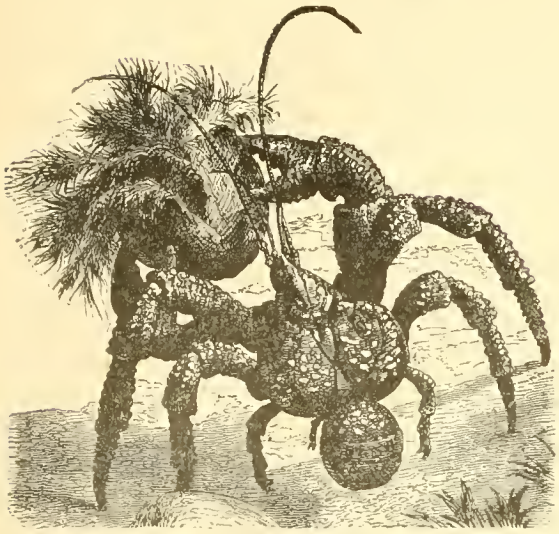


FIG. 6.—COCOANUT-CRAB

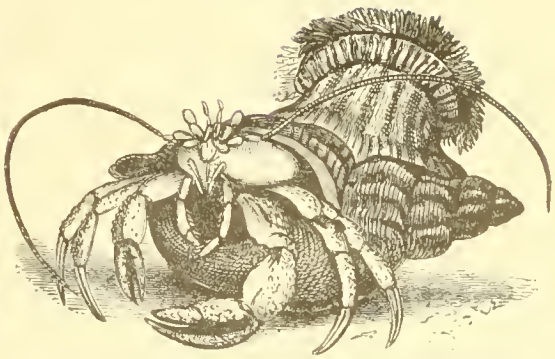


FIG. 7.—HERMIT CRAB

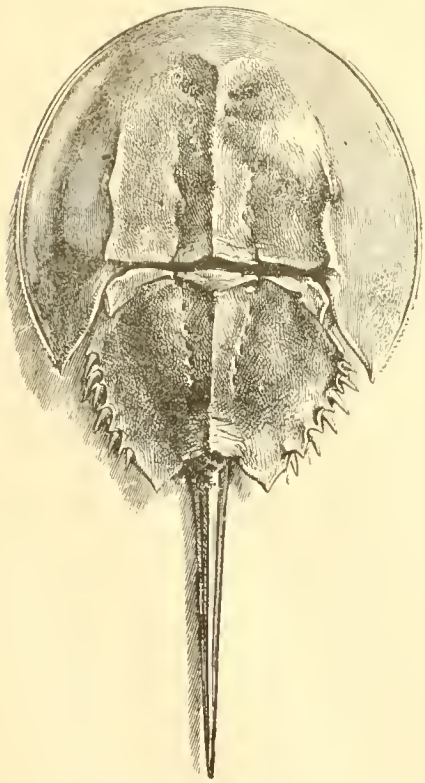


FIG. 8.—HORSE-SHOE-CRAB.

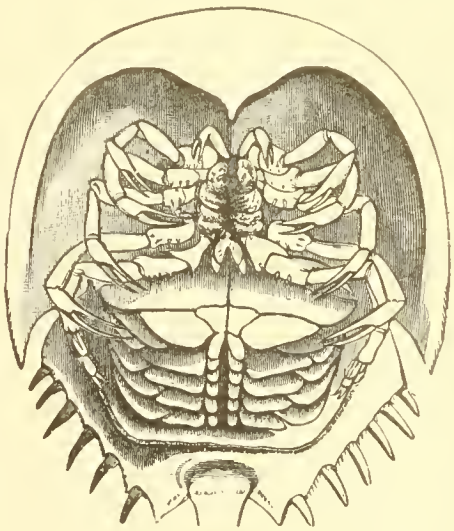


FIG. 9.—THE HORSE-SHOE-CRAB, UNDER SURFACE SHOWING JAWS.

great changes in form to reach the adult state are said to undergo a *metamorphosis*. Many creatures besides crabs do this. Can you think of any? During growth crabs moult several times, becoming each time more like the full-grown animal. The edible crab (Fig. 1) just after shedding his crust is sold as a delicacy in summer under the name of "soft-shell" or "shedder-crab." The illustration shows the edible crab of Europe; the American edible crab is essentially a swimmer and has the hindermost pair of feet flattened. At one stage of growth crabs resemble lobsters. (Fig. 2).

Kinds of Crabs.— There are many kinds of crabs; some are only a fraction of an inch across, and from this they vary to those which, with legs spread, cover a space of more than a yard square. One Japanese crab measures over ten feet between the outspread pincers, but the body is relatively small. One of the smallest is the little Pea-crab or Oyster-crab often found in oysters within whose shell it lives. A curious crab is the Fiddler-crab, whose right pincer is very much larger than the other, and when this is closed upon the front of the body he appears a little like a violinist ready to perform on his fiddle. He is also called Soldier crab and "Calling-crab," the latter, because when scuttling over the mud he waves his great claw aloft as if calling or beckoning to some one. Another interesting fellow is the Hermit-crab (Fig. 7) who, having only the cephalo-thorax hard, protects his abdomen by "backing" into an empty snail shell, leaving only his antennæ, big claws and first pairs of feet sticking out. When he outgrows his house which he carries around with him, he leaves it and hunts up another. Stranger still is the so-called Horse-shoe (Figs. 8 and 9) or King-crab, common on our Atlantic coast, which, however, is not really a crab at all.

There are some queer crabs with long thin legs known as spider crabs. (Fig. 5). They have a remarkable habit of getting under a sponge, forcing it open, and so getting it fixed upon their spiny backs. Of course the fish that saw a loose sponge rolling along towards it would never dream there was danger in it; but so it is, and the spider-crab gets a meal without much trouble.

Somewhat similar to the spider-crab is the thornback (Fig. 3) whose shell is thickly covered with spines and knobs of various sizes.

It used to be stated that the cocoanut-crab (Fig. 6) was in the habit of climbing the cocoanut palms, picking the fruit, throwing it to the ground, and then breaking the shells to get at the kernels. The climbing powers of this crab, however, do not appear to have been observed by any reliable person. You have sometimes seen in fruiterers'shops the cocoanut with its thick, fibrous overcoat on — of the substance of which cocoanut matting and doormats are made. The cocoanut-crab tears this fibre off the fallen fruit, and gets to the end of the nut, where are the three smooth pits, the "monkey's eyes and nose." This crab has two pairs of pincers — the usual heavy pair and a thin small pair. With his heavy claws he hammers at one of the "monkey's eyes" until he has broken it through; he then inserts one of the small nippers, and extracts a portion of the cocoanut flesh, which he eats. And so he becomes fat and enticing food for the natives, who set out in parties to hunt him.

Besides feasting so daintily, the cocoanut-crab likes to take his rest cosily; so he digs out a deep cave beneath the roots of a tree, and in it he lays a thick, soft bed of the finest cocoanut-fibres, carefully selected, on which he reposes.

There are other land-crabs beside the cocoanut-crab. There is one in the West Indies, who makes his home chiefly in the forests far inland, living in holes. In the rainy season this species quit their holes and getting in enormous companies make their way straight for the shore. Nothing but broad rivers can stop them, and they do a vast amount of damage on the way.

Uses.— Have you ever eaten lobster or crab? Then you know what some crustaceans are good for, and will not be surprised to hear that thousands of people in the United States are busy catching, preparing and selling these creatures. If your home is in Boston or New York, or some

other city near the Atlantic, you may also have seen in the fish markets shrimps, which are relatives of the lobster and crab.

Crustaceans are also useful by acting as scavengers. How?

How Captured? — Crabs and lobsters are caught in traps, which are arched cages made of netting strengthened with hoops of wood or iron and having an opening on each of two sides. These are called "lobster-pots." They are baited with dead fish and sunk in the proper places, their position being marked by a float. The crustacean easily gets into these traps, but not out.

Suggestions and Notes.— In teaching this, as in teaching all lessons, *tell* as little as possible. *Draw out* by judicious questioning. For example, in beginning do not tell the color, the pupil ought to be able to tell *you*. So with every other point. Tell only such facts as the pupils do not know and cannot readily find out. When you come to the crab have the pupils in the same way see and tell you the various parts from the specimen, if you have such (and you ought to have at least one) or from a drawing previously made. Make a list of these on the board side by side with those of the lobster, and then, with this before them, ask the pupils whether on the whole the crab is like or unlike the lobster. Then you can ask for the points in which it differs, or saying nothing about these, let them form a subject for composition — "How the Crab differs from the Lobster" or "Why the Crab isn't a Lobster." Of course the less obvious parts you will omit with younger pupils. The amount that is taught is of less account than the way in which it is taught. A complete comparative list would be something as follows:

	THE LOBSTER.	THE CRAB.
Color.	dark greenish.	dark greenish.
General form,	long, cylindrical.	broad, flattish.
Main Parts.	head-thorax or cephalo-thorax.	cephalo-thorax.
	abdomen (7 pieces).	abdomen (7 pieces).
Other Parts.	pair stalked eyes.	pair stalked eyes.
	" antennules.	" antennules.
	" antennæ	" antennæ.
	" mandibles.	" mandibles.
	2 pairs maxillæ.	2 pairs maxillæ.
	3 " jaw feet or maxillipeds	3 " maxillipeds.
	pair pincers.	pair pincers.
	4 pairs walking feet.	4 pairs feet.
	5 " swimming-feet or swimmerets.	6 " swimmerets.

If you live within a hundred miles of the Atlantic you will know where to get specimens of lobsters and crabs. If you live farther off you can, probably, at times, get boiled lobsters, and by leaving a special order at your fish-market get fresh specimens. If crayfish are accessible use these, and by all means have some alive in a jar of water; put in with them some of the little snails found where you get the crayfish and they will serve as food for the latter. Your boys will be glad to catch all these for you.

Appended are a few subjects for composition; these will suggest others to you. If you have given the previous lessons in this series make this work comparative as much as possible.

1. Describe a lobster — size, color, number and shapes of legs, form, size and names of other parts; anything else you can see.

2. Describe a crab in the same way.

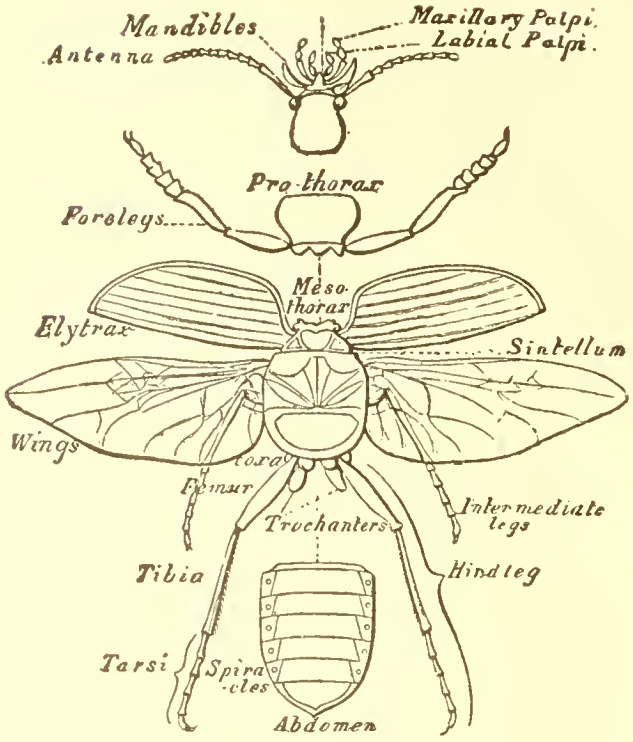
3. Describe the different things a lobster can do, what he eats, where he is found, what he is good for and how he is caught.

4. Combine 1 and 3 and tell all you know about the lobster.

5. Write a complete description of the crab.

6. Compare the lobster and the crab, mentioning first the points in which they are alike, then those in which they differ.

The teacher will find further information in the following books: Huxley, *The Crayfish;* Encyclopædia Britannica, articles *Crustacea*, *Crab;* Science Guide No. VII., Boston Soc. Natural History, *Worms and Crustacea;* Scribner's Monthly, June, 1881 (Vol 22, p. 209), *The Lobster at Home*, an entertaining account of the industrial side of the subject.



INSECT, SHOWING PARTS.

NOTES OF LESSON ON

INSECTS.

(This lesson should be illustrated with diagrams and with specimen if possible).

I.—Why So Called. The Chief Organs.—Show from the illustration or specimen that the body appears to be *cut-into* in two places, giving three natural divisions to the body. Hence the name insect — *cut-into*.

The *head* carries the *mouth* apparatus, the *eyes* and the *feelers*.

The *chest* (or thorax) carries *three pairs* of legs below and *two pairs* of wings above.

The *body* (or abdomen) sometimes carries a *sting*; and sometimes a special organ for *boring*, and then *conveying eggs* into the holes.

II.—Segments and Joints.—Call attention to the rings of the body. Insects belong to the great subdivision of the boneless animals, which have the skin divided into rings or segments. Insects usually have *nine* segments in the body, and *three* in the chest and the head forms *one* piece. But all these segments are not always distinguishable except with the aid of a magnifying glass. They may, however, be clearly seen in the caterpillar, and the body segments are fairly dis-

tinct in most butterflies, moths, ants, bees, and flies.

The segments are formed of hardened skin, but the skin between the segments and which connects them is not hardened; it is pliant, tough, and elastic, and answers the purpose of ball-and-socket-joints. The segments themselves are not perfect rings. Each consists of two half-bands — an upper and a lower — joined by the pliant, elastic skin. This arrangement gives considerable freedom of movement. (See Fig.)

III.— The Head.— The head carries the apparatus of the mouth, the eyes, and the feelers. The structure of the *mouth* varies of course with the kind of food on which the insect feeds, but in one particular they all agree: when jaws are present they always open sideways, and not up and down like our own. There may be several pairs of jaws one behind the other; some are formed for cutting and tearing, others for crushing, and some have the edges toothed like a saw. Some insects have trunks instead of jaws through which they suck juices — it may be nectar of flowers, or the blood of other animals.

The *eyes* are not single like those of vertebrate animals; but each eye consists of a large bunch of very small eyes. Each eye may thus be made up of thousands of small eyes. They usually stand well out from the head so that the insect may see in every direction — above, below, beside, before, behind.

The *feelers*, one on either side of the head, are of various forms, shapes and sizes. That they are of great service to the insect, is quite certain, for the animal cannot live long without them; but of their exact use we are ignorant. They may be organs of feeling, sense or hearing.

IV.— The Chest. — The chest carries the *legs* and *wings*. The legs are always *six* in number. The *wings* are usually *two pairs*. Very often, as in the beetles, the front pair are hardened, and used to *protect* the second pair, and not for flight. In some of the flies the second pair is wanting, but their place is marked by two little stalks with knobs at the ends. *Balancers* they have been called, because it seems they act as balancers during flight, and the insect cannot fly without them. In a few insects the wings are entirely wanting. Some of the ants shed their wings after a certain period.

V.— The Body.— The segments are usually distinct in the body. In those insects whose front pair of hardened wings covers the upper surface of the body, the segments are solid below only and not above. The wing-cases, in fact, do the duty of the hardened skin.

A close examination between the segments, and between the upper and lower half of the same segments, will discover a number of small holes on either side; these are the ends of fine tubes, which communicate with two larger trunks running along each side of the body. From these main tubes other and smaller tubes branch off, and these again send off smaller tubes which traverse every part of the body. These tubes are prevented from collapsing, or falling together, by a kind of *elastic* spring coiled up closely between the two membranes of which the tubes are built up. These tubes are the breathing organs of the insect. It has no provision by which the blood is brought to one particular part for cleansing, and so the air is taken to the blood-vessels in every part of the body. By this beautiful arrangement not only is the insect endowed in proportion to its size with life, vitality and strength beyond all other animals; but its weight is reduced to the extreme limit.

I.— Kinds of Insects.— The teacher may ask for the names of insects, and make a rough classification.

Insects are usually grouped according to the structure, arrangement and number of the wings. The following may be taken as *types* of the chief groups, and the attention of the children should be drawn to the structure of the wings, either by drawings or specimens. Beetle, grasshopper, dragon-fly, bee, butterfly and house-fly.

1.— Shield-Winged.— In the beetles, the first pair of wings are horny or leathery, in texture. They form a pair of folding shutters, and serve as a *shield* to protect the second pair, which are folded crosswise, and packed away beneath. The

hinder pair are much larger than the front pair, and alone are used as organs of flight. This group includes all the beetles, of which eighty thousand of different kinds have been described.

2. — Straight-Winged.—The grasshopper has wing-cases like the beetle, but they are thinner, and show a net-work of veins; and instead of folding straight down the back they *over-lap*. The hind wings are folded lengthwise, and *straight* like a fan; hence the members of this group, which includes cockroaches, crickets and locusts, are called *straight-winged*.

3. — Lace-Winged.—The wings of the beautiful dragon-fly are all used for the purpose of flight. They are transparent, and so full of veins that they look like delicate lace, hence the name *lace-winged*. The May-flies, which live but for one day, and the *white* ants belong to this group. The dragon-fly can fly backwards as well forwards, and with lightning-like speed.

4. — Membrane-Winged.—The bee, like the dragon-fly, has four transparent wings; but the veins are much less numerous. The name is not a good one, because all wings are membranous; but there is no difficulty in distinguishing members of the group because the hinder pair of wings are fastened to the front pair by little hooks along the edge. Bees, wasps, ants, and saw-flies are *membrane-winged*.

5. — Scale-Winged. The butterflies and moths are distinguished by having their wings covered with beautiful scales, and hence are called *scale-winged*. When handled the scales adhere to the fingers as dust; but under the microscope they are beautiful objects.

6. — Two-Winged.—The gnats, the common fly, and many other flies have two wings, hence the name.

II. — Benefits derived from Insects. — Insects are small, and as an article of food for man of not much importance; but as a diet for bats, birds, frogs, toads, etc., they are of incalculable benefit.

The larvæ of beetles, and the caterpillars of butterflies and moths, are eaten with much relish in some parts of the world. Locusts have formed an article of diet in North Africa from time immemorial, and white ants furnish an abundant supply of food for the Hottentots of South Africa. Bees provide us with honey and wax, and silk-worms with silk. The cochineal insect yields a fine scarlet dye, and to the gall-fly we are indebted for the chief ingredient in the manufacture of black ink. Some insects also act as scavengers, removing decaying animal matter which would otherwise taint the air; and they act as checks on themselves, one species preying upon another, and thus preventing its too rapid increase.

III. — Injuries Caused by Insects. — Some insects cause us annoyance rather than injury, the common house-fly, for example; others, like the mosquito and gad-fly, are nothing less than tormentors; but some there are which in their vast numbers become veritable scourges.

INSECT AND SPIDER (a comparison).

Illustrate by diagrams and pictures.

INSECT.	SPIDER.
a. *Body* consists of three parts.	a. *Body* consists of two parts. (Head and thorax form one part.)
b. *Segments*, distinguishable.	b. *Segment* not distinguishable.
c. *Skin* hard, except between the segments. Cast only in the larva stage.	c. *Skin* soft and leathery. cast at irregular intervals during life.
d. *Legs*. Three pairs, each made up of *five* pieces; claws at end.	d. *Legs*. Four pairs, each made up of *seven* pieces; (thigh, and leg each *two* pieces); claws at end.
e. *Wings*. Two pairs, of which one pair, or both pairs may be wanting.	e. *Wings* never present.
f. *Feelers*. One pair: vary very much in form. Probably used for feeling.	f. *Feelers*, changed into a formidable pair of jaws. Each consists of two pieces, of which the outer is claw-like and capable of being folded back into a groove of the other. Canal throughout connecting with poison gland.
g. *Spinning* apparatus, found in some insects, especially catipillars. Thread passed out through mouth, and hole in lip. Spin cocoons in which to live, or pass from larvæ to pupa-state, or thence to the perfect insect.	g. *Spinning* apparatus possessed by all spiders. Spinnerets on under surface of body near the end. Spins cocoons as egg-cases, also webs as traps, or habitations.
h. *Eyes*, compound, a pair, each containing a large number of simple eyes.	h. *Eyes* simple, and varying in number from *one* to *six* pairs.
j. *Breathing* apparatus consists of tubes running throughout the body.	j. *Breathing* apparatus little sacs opening on the under surface of the body towards the front. A few have air-tubes also.

NOTES OF LESSON ON

SILK.

PRIMARY GRADE.

BLACK-BOARD PLAN.

I. Silk.

II. The Silk-worm.

a. Kind of Animal { not a worm / but / an insect.

b. Where found.

c. Food of { The mulberry / Osage orange.

d. Elaboration of the silk and the spinning of the cocoon.

III. How Silk is obtained from the Cocoon.

Kinds of { floss-silk / spun-silk / raw-silk

IV. Sericulture.

a. Development of the industry.

b. Rearing of the worm { eggs / hatching / feeding / cleanliness / diseases / stifling

V. Sericulture in the United States.

Silk should be cultivated on account of

a. Our climate.

b. Our manufactures.

c. Our poor.

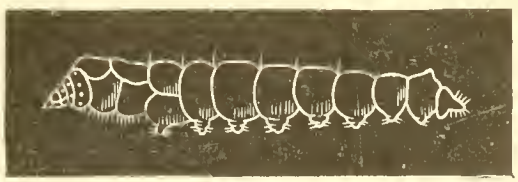
Grade.— Fourth year in school.
Average age of pupils.— Nine years.
Object of Lesson.— Information and Language.

An object lesson suggested by legitimate school-work usually proves both interesting and instructive. Our class were delighted by reading Miss Jane Andrew's *Each and All;* they were so interested in their little sister Pense and her work on the silk-farm that we knew just where to find the key-note for the next week's object lesson.

In preparation for the lesson, each pupil was asked to bring to school on Monday morning, a small article made of silk. The table on which these were placed assumed a pyramidal form, and looked like a receiving ware-house or curiosity shop. The collection, beginning with a vivid scarlet shawl, evidently "borrowed" from grandmother's wardrobe, was a unique one as the following list used for spelling lesson will show:

cushion	*mitten*	*velvet necktie*
satin shoe.	*ribbons*	*scarf*
gauze veil	*stocking*	*thread*
glove	*parasol*	*crape veil*

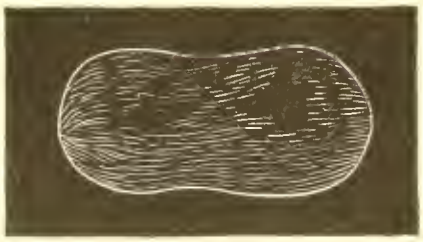
After a little familiar conversation about use, color, material, etc., the words are spelled and attention is called to the picture of the silk-worm and cocoons, the pupils being encouraged to draw with the teacher.



SILK-WORM.

We have a box, containing several cocoons, a skein of raw silk and the large colored chart, but do not wish the children to use it until our subject is more their own. Fortunate are you, dear teachers, if you are not of that large class who "dread to sketch before the children." But while the art of illustrative drawing is a most happy aid to the possessor, we may, any and all of us succeed in making the simple outlines necessary to strengthen, to vivify the mental picture. However if you have not courage to draw before the class, place your drawings on the black-board before school, and by some simple arrangement of wire and cambric, cover until you are ready to use. In every class there is at least one pupil ready to

respond to the question — Who can tell us something about this?



COCOON.

Our star on this occasion is a John. Nothing so delights John as the consciousness that he *knows* something about the topic presented by the lesson. He fairly beams as he tells us that the "little round thing" we have drawn is called a cocoon and the caterpillar made it.

Teacher.— Yes, John, cocoon is the right name, but let us try to find another name for it.

A flutter of hands, and Mary gives us *case*, because it is all closed up." Alice calls it a *house*, "because the caterpillar made it."

Paul thinks that he would call it a *shell*, as it "looks like a peanut."

This free and easy style of conversation is encouraged among the children for the reason that too much formality tends to extinguish interest: most of the terms are accepted and written on the black-board, the word cocoon heading the list in yellow crayon.

Teacher.— All the articles that you brought to-day are made from thread spun by this insect, something like the caterpillar; after it begins to spin, it makes a house of silken threads, winding the threads around its body until completely covered, and the covering we call a —?

Class.— Cocoon.

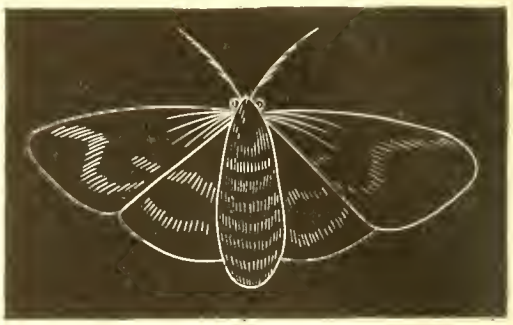
Teacher.— After working so hard it rests by going to sleep and sleeps for about three weeks.

Mabel.— I know what happens while it is in the little house. It changes to a butterfly.

Teacher.— We will call it a moth. See, I will make a picture of one; you may draw with me.

The children, most of them familiar with the transformation of grub to butterfly, are eager now to relate their experience, and by question and answer we show the similar working of this insect.

The drawings of cocoon and caterpillar are finished; nearly a half hour has been given to the whole exercise, and the children are dismissed with unflagged interest, and the injunction to try to have something else to tell us to-morrow about silk-worms.



It is encouraging to find, that while only a few have new facts about the silk-worm, all are ready to tell what was learned in the preceding exercise with a fair degree of accuracy.

"You may begin the *talk*, children," says the teacher.

Evidently they are quite ready. *Jack*, whose brother is an academy pupil, is able to tell us that the silk-worm "eats an awful lot, and feeds only on the leaves of the mulberry tree."

Mary, who rejoices in several bound volumes of St. Nicholas, has a fund of information. She tells us that "when the moth is ready to come out, it makes a hole in one end of the cocoon and cuts the silk thread so that it is no good."

Teacher.— What is then done? Jack's eager tongue escapes its bounds; his "I know, Miss— I know" is excused and he is allowed to describe — in his own inimitable style— the placing of the cocoons in an oven in order to destroy the moth, the soaking in warm water, to soften the gum and unwind the silk.

The information possessed by the children is supplemented by facts relative to culture, habits, and value of the silk-worm.

As the lesson grows, the teacher puts, as they are used, the following words on the black-board:

caterpillar. *silk-worm.* *woven.*

mulberry	*spinning.*	*insect.*
hatched.	*soaked.*	*oven.*

In the afternoon we have an exercise in geography, referring to the map to locate China, Japan, France, Georgia and Connecticut.

Incidental facts about climate, customs of the people, etc., are naturally brought out. Our box of golden treasure is given the children, and they are directed here and there in search of information about this wonderful spinner.

Having worked in this way for three or four days we are ready to review.

Pupils are called upon to give, in turn, a fact of structure, habit or culture.

While interrupting but seldom, we try to lead them to give the points in systematic order, sometimes placing suggestive words on black-board to bring out desired information.

The limits of this article allow but a few of the interesting facts that the children are able to give about their friend the little silk-worm.

Mary.— The silk-worm belongs to the insect tribe.

Alice.— It must have a warm place and it feeds on the leaves of the mulberry tree.

Paul.— Silk is made in China, in France, and in parts of our own country.

Edith.— I am going to have a silk dress when I am a big girl. (Important fact to her.)

Margaret.— The silk worm spins a cunning little house for itself.

James.— The house is called a cocoon.

Philip.—When people want the silk thread they must destroy the insect before it makes a hole in the cocoon.

Arthur.— Lots of things are made of silk.

Teacher.— Name some of them, Frank.

Frank.— Neck-ties, button-holes, veils and gloves.

Amy.— The Chinese were the first people to make silk.

Thus we get, by their ability to impart, a true test of the work.

We have gotten three spelling lessons, two lessons in geography, four exercises in oral language, one in illustrative drawing, and an indefinite number of reading lessons. We will sum up the week's work with an exercise in written language. This is to be a "surprise lesson." Friday morning each pupil is given a bit of bright colored silk cut in the form of a moth and requested to tell something about it in a letter or short story.

Some of the results may be shown by the following — copied *verbatim et literatim*: —

(*Best*).

A DREAM.

Last winter, I visited my grandma and on the old-fashioned bed there was a lovely silk-quilt. I fell asleep counting the pieces. That night I dreamed that I was a little Chinese girl and my name was Lou Sing.

We lived near a river and had a garden with many mulberry trees in it. My father raised silk-worms and my little brother helped me take care of them. Father put the silk skanes in a soft paper and took them to a silk merchant in the city. With the money he got, he bought many nice things and a beautiful sunshade for me.

This was only a dream. In the morning grandma gave me some pieces of silk and I am going to make a silk bed quilt for myself.

Edith ——,(Age, nine years).

(*Average*).

Dear Mother:

I have a piece of red silk and Miss ——, wants me to write something about it. I think this piece of silk came from France because that is a very warm country. The little worm that spun the silk was not very large, my teacher has some cocoons and a skein of silk thread. Sometimes a thousand feet of silk is reeled from one cocoon and it takes four hundred cocoons to make one pound of silk.

Willie ——, (Age, eight years).

(*Poorest*).

Silk don't grow on trees like cotton. A butterfly lays some eggs and a little worm is hatched and spins a cocoon and we get the silk and out comes your butterfly.

John ——, (Age, nine years).

Our object lesson on the silk-worm is finished — the children have had a small portion of the marvellous structure and economy of these little insects — enough maybe to make *some* of them by and by enthusiasts in silk-culture and surely *all* of them are now able to read between the lines the Spanish proverb —"With patience and perseverance the mulberry leaf will become satin."

— L. M. Bagley.

FIG. 1.—TIMOTHY.

FIG. 2.—RED-TOP.

FIG. 3.—SWEET-SCENTED VERNAL.

FIG. 4.—SUGAR CANE.

NOTES OF LESSON ON

PLANT LIFE.

BLACK-BOARD PLAN.

I. Plants are useful for
Food, Shelter, and Clothing.

II. Plants most useful to man are
Trees, Shrubs, and Herbs.

III. Herbs.
- grasses.
  - meadow grasses,
  - cereals.
  - sugar-cane.
  - bamboo.
- pulse.
- edible roots, leaves, stems, etc.
- cotton, flax.

IV. Meadow grasses.

a. Kinds
- timothy.
- red-top.
- sweet-scented vernal.
- and others.

b. Uses of Meadow grasses.
Food for domestic animals.
To beautify our homes.

HINTS.

a. That under matter must be given *by* the children themselves. Our aim is merely to put before you the material for a lesson in a way that shall suggest to you an easy and effective manner of presenting it. Your work is, with the aid of pictures and specimens, to make the class discover all that is stated, and put it into pure, clear English.

b. Remember that it is by doing, observing, and talking that children learn. In order to interest them

in the coming lesson, and to prepare them for it, have them, sometime previous to it, begin to make a collection for your table of the grains, pulse, etc., named. Small, wide-mouthed bottles are convenient for holding the specimens. At odd moments during the day, and at recesses, show the seeds of the cereals, and talk about them until the children can readily distinguish and name the oats, wheat, barley, etc. Have the class plant peas and beans in pots in the window, early enough to have them in blossom the day of the lesson, and sow a little later some cereals and other grasses. (A school which has been doing this work has not only evinced great interest in the growth of the plants, but has enjoyed representing them upon the black-board. An excellent practice, because it makes the children sharp at observing differences.)

c. When at last both children and plants are ready for the lesson, have each child bring in a cross-section of wood, showing the softer part in the centre. (A piece of a young tree, or a rather small branch of an old one, is best.) Have him also provide himself with a grass plant having roots and both old and new blades, also with one or two specimens of other herbs.

The pictures can be drawn upon the black-board, or printed ones, pasted upon card board, can be given to each member of the class.

Do not give too much of the lesson at one time. The interest of the children must not be allowed to flag. It is better to stop too soon each day than not soon enough.

d. Adapt your style of teaching to the class of children you are dealing with. In some schools such terms as structure, nutritious, vernal, can be used without explanation; in others not. If you are among children that are likely to become farmers, lead them to feel the importance of trying to find out by experience and study, as they grow older, what the best grasses for cultivation are.

If you are in a manufacturing village, and have among your pupils many of poor parentage, enlarge especially upon the beauty of grass. Encourage Patrick's going home through the streets where the prettiest lawns are kept, and let him tell you about them the next day. Give him a little grass seed to plant in his own door-yard, and some night after school walk home with him to see how it is growing. It will do you both good.

e. Encourage the children in exercising care concerning the grass in the school-grounds. Let them trim the edges, rake up the leaves, enrich the soil, and water it if necessary.

I.—MATTER TO BE TAUGHT.

The bread, potatoes, and other vegetables we have eaten to-day; the coffee, tea, or chocolate we have drunk, have all come from plants. Our houses which shelter us from the heat, the cold and storms, are made partly or almost entirely of wood. Our handkerchiefs are made of linen, the fibre of the flax, and our aprons of cotton. We see that plants are useful to man for food, shelter and clothing.

II.—TREES, SHRUBS, HERBS.

Look at a piece of a tree. On the outside you find the bark, next to the wood and in the centre a softer part called the pith. A plant having these parts and arranged in this way is said to have a woody structure. Look at grass, clover, and some other plants. You find they have not a woody structure. As warm weather comes on, all the little twigs and branches of the trees and bushes become covered with beautiful green leaves. The dry, withered stalks of the grass and clover will never grow green again; new ones will be sent up from the root instead. That is because these plants died to the ground last fall. We see, then, some plants have a woody structure, and do not die to the ground as winter approaches, while others have not a woody structure, and die to the ground annually. The first are trees and shrubs; the last are called herbs. Usually a plant having a woody structure is called a tree if it is thirty or more than thirty feet in height, and a shrub if it is less than thirty feet in height, but these distinctions do not always hold. The coffee and the chocolate tree are considerably less than thirty feet in height, and yet are always called trees. (The children will learn later that some trees, as the palm, do not have a woody structure.)

III.—SPECIAL STUDY OF HERBS.

Look at the grass and compare it with the clover of some other herb. Examine also the pictures, as they represent the plant when fully grown. We

see that there are four parts to the grass, — the roots, the stem, the blades or leaves, and the flower. The stem has joints, and is hollow except at these joints. At each joint there is one blade or leaf; these leaves have in them parallel veins. Notice how regularly the leaves are arranged, one on one side, then on the other, or *alternately* as we say. The third leaf comes above the first, the fourth above the second, and so on. Now look at the wheat, rye, etc. We see that they have the same arrangement or structure, while the clover has not. All herbs having the structure of grass are called grasses.

Examine the peas and the beans. They have not the structure of grass. Their fruits grow in pods. Some other plants have flowers like those of the pea, and produce their fruits in pods. All such herbs are called pulse.

Other herbs unlike grasses and pulse are useful for food. We eat the roots of such as the beet, turnip, etc.; the stems of others, as the celery, asparagus; the leaves of others, as the cabbage, lettuce, etc. Anything good to eat is said to be edible. Among the useful herbs are edible roots, stems, and leaves. Still other herbs, as cotton and flax, are useful for clothing. (Cotton grows on trees, shrubs, and herbs.) The kinds cultivated are shrubs and herbs.

Kinds of Grasses. — All over our hillsides and meadows are grasses which grow well in our meadows, and are cultivated there. They are called meadow-grasses. When corn, wheat, barley, oats, etc., are coming up, they look much like common grass. Examine them later, and you will find they all have the structure of common grass, so are grasses. (We have found that most of the grasses have a hollow stem, the corn does not.) The seeds of our wheat, corn, and rye are ground into flour, and used in making various kinds of bread. The people in northern Europe and Scotland grind the seeds of barley and oats, and use the flour for cakes and other kinds of bread. In China rice is made into bread. Any grass seed good for making bread is called a bread-corn. A grass which produces bread-corn is a cereal.

Examine Fig. 4, which represents a piece of sugar-cane. You observe that this is also a grass.

Turn to your geographies, and see if you cannot find a picture of a bamboo forest. Notice to what an immense height the bamboo grows. Some of it is as tall as our maples and elms are, and yet this dies to the ground and is therefore an herb, and it has the structure of grass, as you will see if you can obtain a bamboo fishing-pole. You have now learned that among the most useful grasses are meadow-grasses, cereals, sugar-cane, and bamboo.

IV. — SPECIAL STUDY OF MEADOW-GRASSES.

It may seem to you as if our meadow-grasses are all alike, but study them a little and you will discover there are many kinds. We will notice three or four of the most valuable only. See Figs. 1, 2, 3. They all have the hollow, jointed stem, and the leaves arranged alternately, as we have before seen, but they are quite unlike in their roots and flowers. Fig. 1 represents one of the most common of our cultivated varieties. The root looks like a little bulb; and the flowers grow on a long spike like a cylinder in shape. This kind is supposed to have been brought from Europe many years ago by a man named Timothy Herd, and for this reason to be called timothy or herd's grass. The seed for this is cheap, and easily procured. The grass grows well, and the hay sells well in the cities, as most men like it for their horses. For these reasons farmers plant a great deal of it. Some men, however, think it is not quite so good for food, that is, not so nutritious, as some other kinds are.

Fig. 2 shows us another very valuable grass. The part that sends off the little roots seems to creep along the ground, and the flower stalk sends off many small branches. Because this grass is of a purplish color, it is called the red-top. In

Pennsylvania *this* is called herd's grass. This does not ripen quite as quickly as timothy, but makes a rather heavier crop, especially on dry land. It is said to be more nutritious than the other, and cattle like it better. You have often seen farmers cutting a second crop of hay from their meadows; this is rowen, or aftermath. The rowen crop of red-top is often not worth cutting. This is one reason farmers like timothy better.

We have all noticed what a delightfully sweet odor there sometimes is in the air when the new-mown hay is lying in the fields. The baskets made by the Indian women often have the same fragrance. This comes from another kind of grass (see Fig. 3), not quite so common as the first two. It is the sweet-scented vernal. The word vernal means spring. This blossoms very early, as early as the last part of May in Massachusetts. We can always tell it by its fragrance.

Use of Meadow-Grasses. — They are invaluable to man as food for many of his domestic animals. Thousands and thousands of horses, sheep, and cows feed upon them. They are almost as valuable as the cereals upon which man so largely lives.

Grasses are also useful in making our homes beautiful. The poorest, plainest house becomes pleasant to the eye if surrounded by a well-kept grass-plot.

— Elvira Carver.

NOTES OF LESSON ON

INDIAN CORN.

BEFORE proceeding to experiments in cooking any article of food, it is always well to show its connection with school studies.

This grain is chosen for special study as the one member of its family best suited to our needs, since it is a native American.

There are plenty of selections from poetry and prose, that might profitably occupy an hour of school, without touching upon its practical side.

The subject may be considered under these heads:

Growth.	History.
Uses.	Legends.
Commercial Value.	Poetry.

In studying food plants, children should early understand the division of plants into families, and learn to trace resemblances.

City children cannot readily comprehend this unless the teacher provides specimens; but country children can easily see in the early growth of wheat, corn, and other grains, their likeness to the grass family, of which they are members.

By mentioning sweet corn and sorghum, and comparing the outlines of the two plants, it is easily shown that the sugar-cane is a near relative of maize.

Sugar in large quantities has been extracted from some varieties of corn. The botanical name of corn is *Zea Mays* — that of sugar-cane, *Saccharum Officinarum*.

The *Growth* of corn is in every respect remarkably affected by climate and soil. All varieties grown in the United States are of one species and owe their peculiarities to circumstances.

Considerable heat is necessary for its full development, as is shown by the great height of the Southern varieties.

The color of the kernels ranges from white through yellow to dark red, and even purple; the shape, from the tiny rice grains of the pop-corn to the long, sharp kinds of the South and West, and the wrinkled sweet kernels. A Rocky Mountain variety has a husk over each separate kernel.

The kinds most valuable are the staple, Indian corn, the sweet, and last — but far from least in the estimation of children — the pop-corn.

The *Uses* are so many, it would require more space than we have here to give them all.

It contains all the qualities needed to sustain life, in one of the cheapest forms, but is too concentrated except for people of active habits of life.

The principal food of the Canary Islanders — a fine race physically — is gofio, a preparation of corn, parched before grinding.

All dishes, in which corn is the principal ingredient, require long, steady cooking, and, perhaps, for this reason many of the old-time dainties have fallen out of use, the Americans being in too great a hurry to stop to prepare them.

Hulled corn, mush, hominy, brown bread, Johnny or hoe cakes, Indian pudding, succotash — all of these, and more, we owe to *Zea Mays*.

It is also converted into flesh of animals, which furnishes much of our food. Not only is the ripe grain and meal of corn and cob, ground together, given to animals, but ensilage — prepared by cutting thick sown corn when green, packing in a pit or silo, and covering from the air — gives fresh food to cows and oxen through the winter.

The husks, dried, are used for mats, and filling for beds and cushions. The stalks may furnish fuel, thatch for roofs, or may be made into baskets. Paper has been manufactured from some portions.

Where fuel is scarce and the corn crop abundant, many people have been kept warm by burning ears of corn. The cobs alone, or soaked in oil, are useful for kindling.

The commercial value of the corn crop of this country is, perhaps, best indicated by statistics.

The reports of the U. S. Department of Agriculture for 1884 gave the total yield as over 1,795,000,000 bushels, produced by about 70,000,000 acres of land.

The value of this crop was estimated at $640,000,000.

The States standing first as corn producers are Iowa, Illinois, Missouri, Kansas, Nebraska.

The canning of sweet corn and use of pop-corn by confectioners are also sources of considerable revenue to the farmers.

The *History* of corn is so interwoven in that of our country that any school history must furnish some items; several will be found in "*Our Fatherland*."

The word corn, as used in the Bible, and as often now used in England, refers to any grain.

Some have claimed to find maize near the ancient ruins, and that it was represented in old Chinese books, but the weight of evidence is on the side that it was unknown in the old world until after the discovery of the new; that is granted by De Candolle, one of the best authorities on botanical subjects.

Columbus is said to have brought it to Spain about 1520. The early settlers of America found maize growing in all parts of the country. Francis Bacon, in his Natural History, says, "Indian Maize hath an excellent spirit of nourishment; but it must be thoroughly boyled, and made into a maize cream like a barley cream."

Through the use of maize several Indian words have been added to our language, as hominy, samp, succotash.

The *Legends* connected with it are many.

One Indian story tells where the good spirit touched the ground there sprang up, on one side, maize; on another, beans.

Longfellow's "Hiawatha" is a combination of Indian traditions on the origin of corn, and several suitable extracts can be made for this exercise. The fifth and twelfth sections of the poem have most to do with Mondamin.

NOTES OF LESSON ON

THE APPLE.

[Black-board sketch to be written as the words occur during the lesson. Such a sketch, for lessons, should be very plainly written, consist of few words, which should suggest the main points in the order in which taught.]

INTRODUCTION. — Show an apple — its name? What it is — fruit of a tree. Speak of size, form, color, etc. Its commonness, often seen and liked; why? Let us first learn what the *eye* teaches about the outside. Its shape? — *round*, something like a ball; *smooth:* its *color?* — *green*, *red*, *brown*, *yellow*. The three PARTS, the *apple;* at one end, a *stem;* its use? at the other, a small bunch of very little *leaves*, withered; on some apples we may count *five*, we may call it the *eye*. Number of parts? *three*. Names? — *stem*, *apple*, *eye*. What does the hand tell about the apple? Feel it: *smooth*, *heavy;* squeeze it; we can't crush it as an *orange*, nor break it as an *egg*, yet not hard as a *stone* or piece of *wood*. We call it *firm*. It has a pleasant — *smell*.

Let us look now at the *inside*. (*Cut the apple across, point out the several parts as named. Sketch the outline of the section on the blackboard.*) We see *rind*, *pulp*, *core*, *seeds*, four parts. The *rind*, a thin *skin*. Cut off a piece — another word for this, *paring*. Use of rind? We may know this by seeing what happens when the rind is taken off. The pulp changes color, loses its nice taste, soon gets rotten; the skin keeps the apple sound and good — one word for this? — *preserve* it. (2) The *pulp* is the part we eat. As we cut it, the knife is wet; this is caused by *juice*. Taste it — sweet? sour? the pulp tastes like this, too; how nice to eat! Inside the pulp (3) is the *core*, made of substance as *thin* as paper, but *tough*, leather-like, in small pieces, joined at edges, forms small, hollow places. Count them. there are *five;* (4) inside are the *seeds*, one or *two* in each little hollow. The *rind*, the *pulp*, the *core*, all help to *keep safe*, *protect* the *seeds*.

(Revise by brisk questioning.)

We must now learn what the apple comes from, or HOW IT GROWS. The trees grow in this country; there are many; the place is? — a *garden*, or many planted together, then called an? — *orchard*. Describe the pretty sight in spring, the white *flowers — blossoms*, tipped with red, covering the trees: their quick going away, falling like snowflakes. What is left? a little hard, green knob, where the blossom was: it grows larger, swelling, through the summer, into an apple. In autumn it ripens — the color changes: the pretty look then of the *green or red*, or *golden-colored fruit*. The pleasant gathering; how the men reach them by ladders in the trees; the careful *picking*, packed in baskets, stored in the fruit-house, or sent to *market*, and sold in stores.

The Use of the Apple. — Little children soon learn this. They are *nice* to eat, and good for *food*. They help to make us strong and well. Some things we eat are *pleasant* but not good. Some things are *good* but *not pleasant*. The apple is both, we call it *wholesome*. How are apples eaten? Sometimes raw, just as picked from the tree. When ripe, this is well. What other fruits are eaten in this way? Sometimes cooked, how? *Pies*, *roasted*, *preserves*, etc. So many apples grow, and in so many parts, that they are sold for *little money;* they are? — *cheap*. So all people may have this nice and good fruit. Many are sent in ships from lands where they grow to other lands.

NOTES OF LESSON ON

THE POTATO.

THE problem — how to teach cooking in school — is being gradually worked out in some of our larger cities, and the class of educators who must always object to any innovation, and can find no plea against this save that of lack of time, have been shown that theirs is not a valid excuse for omitting such instruction.

One of the first results of the public cooking schools has been the Boston School Kitchen text-book, prepared by Mrs. D. A. Lincoln, which should be in the hands of every teacher desiring to give such instruction, even in the simplest form. The principles that underlie all cookery are clearly and scientifically explained and the whole ground of ordinary cooking is covered by this little book.

This paper, and others which may follow, are designed to help teachers who, without any special utensils, wish to make a beginning in this line of work.

From experience in ungraded country schools, the writes knows that much of the instruction now given in the Boston Cooking School can be adapted to the limited resources of the average district school-house.

The country school-ma'am who boards around may have secret longings to improve the standard of the daily bread she shares — though the very best is usually set before the teacher — but she needs to be wise as a serpent in undertaking such a reform. Indeed it is doubtful whether she could do much for her own benefit, but she may waken the ideas of the housekeepers and cooks of the next generation.

Too often, New England farmers look at eggs, butter and fruit as so much cash, on no account to be used at home; and salt pork and butter-milk biscuit appear on the table daily if not at every meal. More knowledge of the relative value of foods would show the farmers of the future that it would be money in their pockets to use more of their produce themselves.

Another reason for such instruction is that cookery and housework have fallen into disrepute and need to be raised to a higher level, since few employments so affect our comfort and health. Change in public sentiment on this point will work many improvements in the wages of women by influencing in favor of housework, bright girls who now prefer to go into stores or factories, or to attempt teaching: over-crowding all branches and keeping wages down.

The country teacher must proceed cautiously in introducing such an innovation on established methods. If she proposed to teach cooking some town-father would say, "My gals can learn to cook at home better than that school marm can teach 'em, that aint what she's there for." Or the mothers would take it as a reflection on their established reputations, and popular opinion would prejudice the scholars.

Probably the easiest way to begin would be by a series of talks on the every-day articles of food —as the potato, corn and grains in general, etc.— and with each lesson bring out all possible points, botany, chemistry, and physiology.

Strive always to show that common things are uncommon, being governed by the foundation principles of science.

The potato may form the basis for a talk on fire and water if desired, as in Mrs. Lincoln's text-book, but first give some time to the vegetable itself.

As in any general exercise suggest the topic to the school, asking each one to think of something to tell about the potato at such a time. A few may be disgusted at the choice of such a common vegetable for a school topic and think there is

nothing new to be learned about it; but the majority of children are glad to tell anything they know and will happy to think there is a subject on which they can find something to say.

Begin the exercise by appointing some one to write the principal points on the black-board.

Divide the board after this manner and write as much under each head as there is room for.

THE POTATO { *Growth* / *History* / *Use*

Every country child should know something of the first topic, yet few will have noticed all the points to be mentioned viz., that the plant grows both from the tubers and seed, that a single eye will produce a new plant, that new varieties are obtained from the seed.

Also that the part above ground is never used for food — as the best, etc. — that whenever any tubers come above the ground, they grow green, like the stalks—this is the reason for hoeing potatoes. Explain that the potato is a cousin to many poisonous plants of the night-shade family. Some child may make the point that the tops of potatoes are food for certain bugs; and this would give a chance to speak of the difference in the food of animals and insects and that of mankind. Trace the resemblance between the leaves and blossoms of potato and tomato, showing that they are relatives. Tell them that tobacco belongs to the same race of plants and is quite as unfit for man as potato tops, but is good to destroy vermin. Among city children we find many who know nothing of the season of growth and maturity of the potato — when they are new and when old potatoes. Ask whether all plants have tubers — whether they are the same as the beet, turnip, etc. Also ask of the characteristics of different varieties of the potato as the Chenango, Early Rose, etc.

Then find out what the children know of its early home, etc. Make them feel proud that it is an American.

Some will speak of Sir Walter Raleigh — then ask if there is any other plant that he introduced and which has been of most benefit to the world,— the potato or tobacco.

There is some reason to suppose that Sir Francis Drake introduced the potato rather than Sir Walter Raleigh but it is quite possible that they both brought it to England about 1586. At any rate in December, 1886, ter-centenary of the potato was celebrated in Egland by a meeting at which scientific men read papers and discussed the cultivation and value of the potato, etc. This fact would show the pupils that they are not doing a foolish thing to give some time to the same subject.

There is one anecdote worth repeating to show how natural it is to expect to find fruits above rather than under ground. Sir Walter Raleigh's gardener had cultivated the plant carefully all summer and one day came bringing his master the green balls and asked if those paid for all his care and trouble. Sir Walter said "to pull up the plant and throw it away," well knowing what would then be found.

Tell how prejudiced the people were against the potato at first, that those who were sure it would prove a valuable food wore the flower and tried in every way to make the plant popular. Ask how it would seem not to see potatoes on the table daily, now, and what would take its place. This would lead naturally to the third topic.

Use.— It is principally used for food — what other foods is like it? Probably some one has just said "If we had not potatoes we should eat bread with our meat." Then potatoes would not take the place of meat and we want either meat, milk, or butter with our potatoes. Let us find out what potatoes are made of. If you cut a potato and rub your finger over it how does it feel?

Wet of course.

Then must there not be water in it? Next cut a potato in thin slices and leave in a pan of water, or do this the first of the lesson and now show the starch which has settled in the bottom of the pan. Explain that it is held in tiny cells and when these are cut it comes out; that much of the starch used

for laundry work comes from potatoes. Compare boiled starch with a boiled potato. (Mrs. Lincoln's text-book explains this process clearly.) There are other things in the potato beside water and starch, in very small quantities, a little lime, etc., but it is nearly three parts water and one part starch.

Ask what we have to do to a potato before eating, somebody will say cook it and somebody else suggests washing it. Find out which should be done first and why.

Cut thin slices of a potato, let each child hold one up to the light and look at it and tell what she can see. Often the cellular structure can be shown in this way, and there is usually a distinct line near the skin showing how much nutriment is lost if too thickly pared. Leave some slices in water, and some exposed to the air to show how that acts upon the acrid juice, turning the potato dark.

If time permits, now, or when there are a few moments to spare, speak briefly on the need of cooking food at all, why potatoes alone would not nourish our bodies, etc. In all these exercises leave as much as possible to the children; let them ask and answer their own questions if possible.

Don't let the exercise have a cut and dried appearance, simply try to show the children that there is some connection between school and every-day life (though this is not always apparent in school routine). Teach them to use their eyes to see more in common things than they dreamed possible.

Education is literally to draw out the child's own ideas and make him think for himself.

The average country boy or girl find enough manual training at home and if taught to think for himself or herself, head and hand will work together.

By calling these food-talks we may interest boys as well as girls in subjects quite as important to them.

—ANNA BARROWS.

NOTES OF LESSON ON

SUGAR.

SUGAR of both kinds. Picture of a sugarcane. A little sand and salt should be provided, to be shown when referred to.

I. Its Uses.— Speak first of the common and well-known uses of sugar. When used, where and why. It is put in tea and coffee, cakes, and boiled with fruit. What this is called? *Preserves.* Meaning of *preserve.* Why boiled fruit so called? *Sweets*— kinds, names, etc. Why we like it? *Sugar is used as food.* It is *nice* to taste, and is good for food. Elicit *that sugar is a pleasant and wholesome food.* Let the children name all the ways in which sugar is used.

II. Properties and Qualities of Sugar. —If not too young, and if it be practicable, give to each child, or group of children, a few grains of brown sugar and a small lump of white, on a slate or a piece of paper. Ask for the *color* of each, and how it looks. Sugar is *sparkling* and *brown* or *white.* Touch it. The brown sugar is sticky. Each little piece is hard; they are like *grains* of sand. These are called *grains* of sugar.

Grain means something small and hard, Ask for the names of things made up of grains. *There are grains of sugar, sand, salt.* Some small, hard seeds are called grains. Grains of *rice, barley, wheat*, etc. Put a little sugar in water. What becomes of it? *It melts.* There is a better word than melts. What is it? Hold a lump of sugar over the flame. What happens to it? *It melts.* Explain the difference. The melting of things in water is called *dissolving* it. *Fire melts sugar; water dissolves it.* Look again at the water. What has become of the sugar? Why cannot we see it? It is broken so small by the water that it cannot be seen. How do we know it is there? Let a child taste it. In another glass of water put a few grains of salt, in a third a few grains of sand. Show that water dissolves sugar and salt, but not sand. Elicit that *sugar is brown or white, sweet, in grains, dissolves in water*, etc.

III. Where we get Sugar.— It is bought at the *grocer's*, but it comes from Southern States, East and West Indies. It is got from a *plant.* But from what part of it? It is neither the stem, nor the leaf, nor the fruit, but is in the *juice* of the plant. Sugar is obtained from *the juice of the sugar-cane.* Show a piece or a picture, or the following black-board sketch of the sugar-cane as growing.

II. THE PICTURE EXAMINED.

1. The Stem.— This is a picture of the sugar plant. Name its parts as I point to them.

Stem, leaves, flower.

Look at the stem. What kind of a stem is it?

It is a straight stem.

Yes; and it grows very tall. (The teacher shows how high the stem of 12 or 15 feet would reach in the school-room.) Point out the thickest part of the stem. Where is it thinnest?

At the top.

It gets thinner little by little: what will you say of the stem?

It tapers.

I will show you how wide the thickest part of the stem is. (The teacher draws a part of the *tapering, notched stem* to full size, *i.e.*, about two inches in diameter.) Does the stem seem to be all in one piece? It is made up of *joints.* Come and point out some of its joints. What springs out from the joints?

Leaves.

The stem is called the *cane.* It is hard outside, but the inside is soft and very full of juice. It is from this juice in the cane that sugar is made.

2. The Leaves.— What do you observe about the number of the leaves?

There are very few leaves.

What is their shape?

Long and narrow.

Where do they spring from? What other leaves do they remind you of?

The leaves of wheat; leaves of grass.

The sugar plant with its tall, straight stem, and few long, hanging leaves, is very like grass. But its stem is solid, not hollow like the stems of grass and wheat and barley are.

3. The Flowers.— What a beautiful bunch of flowers the sugar plant has! Where are the flowers in the sugar plant?

At the top of stem.

What is the shape of the bunch? (The teacher may draw a full-sized outline of the conical flower-cluster on the black-board. It should be drawn about two feet in height.)

III.—HOW SUGAR IS MADE.

The teacher may explain in simple terms the different processes.

1. When the canes are ripe they are cut down, close to the ground, made into bundles, and *passed through rollers* which squeeze out all their juice.

NOTES OF LESSON ON

SPICES.

BLACK-BOARD PLAN.

SPICES.

I. *What they are.*
II. *Obtained from what part of a plant.*
III. *Where found.*
IV. *How prepared for market.*
V. *Uses.*
VI. *Principal kinds* { *Ginger.* / *Cinnamon, Cassia.* / *Cloves.* / *Pepper, Cayenne, Pimento.* / *Nutmeg, Mace.*
VII. *Lesson on each.*

MATTER TO BE TAUGHT.

I. What they are.— Spices are vegetable substances which have a fragrant odor and a biting taste, and which are used for seasoning food. On account of their fragrance they are said to be aromatic, on account of their biting flavor pungent, from a word meaning biting.

II. Spice is obtained from what part of a plant.— Sometimes the spice is the root of the plant,— show ginger; sometimes the bark, cinnamon; sometimes the flower, cloves; sometimes the fruit, pepper; sometimes the seed, nutmeg.

III. Where Found.—They are now found in the tropical parts of Asia, Africa and America. Formerly the finest spices came from the group of islands north of Australia, and lying between Papua and Celebes. The soil of these islands,— the Moluccas,— is volcanic, the climate is warm and moist; for these reasons they are especially adapted to the production of the best spices, and have furnished them in such profusion that they are known as the Spice Islands.

*IV.

* Dried, sometimes ground.

V. Uses.—Spices are used for flavoring food and for medicinal purposes

VI. Most important.—Ginger, cinnamon, cassia, cloves, pepper, allspice, nutmeg, mace.

Ginger Plant

GINGER.

Description.— Ginger is an herb which grows to the height of from two to four feet. It has a thick root which creeps under the ground, and from which the spice is obtained.

Where Found.— Chiefly in the East and West Indies. It is cultivated to some extent in Africa. The best comes from Jamaica.

Preparation for Market.— The roots are usually dug when they are about a year old, just after the stalks of the plant have withered. They are washed, scalded to prevent sprouting, and then dried in the sun. Some of the roots are selected with more care than others, and, after being washed, are scraped. This makes them smooth and of a much finer appearance. Sometimes the roots are dug when the stalks are only a foot or two in height. These young roots are very tender and are made into a delicious sweet-

meat, which comes to us in jars, and which is called preserved ginger.

Adulterations.— Most of the ginger sold by grocers is ground. Root ginger is generally sold by druggists. Ground ginger is often mixed with cheaper articles, such as ground rice, wheat, etc. Then to give the mixture a pungent flavor, cayenne pepper and mustard are added.

Kinds of Ginger.— There are two kinds, coated and uncoated. The last is so called because the outer coat of the root has been scraped off, as we have seen is sometimes done. The coated has a brown, wrinkled appearance in the root, and, when ground, makes a powder of a yellowish-brown color. The uncoated is smooth and of a pale buff in color. When ground it is yellowish-white. The uncoated root is often dipped in water containing either lime or whiting, so as to give it a fine appearance. It is then said to be whitewashed.

How to Tell Good Ginger. — Ginger is aromatic and very pungent. It loses these qualities if exposed long to the air, and is then much less valuable. Test it by smelling and tasting. It is difficult to detect adulterations in ginger unless one understands chemistry. The root is sometimes whitewashed, not merely to give it a fine appearance, but to cover up an inferior quality. Whitewashed ginger is known by its color, and also by the fact that the whiting rubs off easily on the fingers. (Let the children try it.)

CINNAMON.

Description.— Cinnamon is the bark of a tree which attains a height of from twenty to thirty feet, and a thickness of a foot or more. The trees live to a great age. Some centuries old produce cinnamon in abundance. The finest spice is obtained from young branches, or from shoots that spring up about the stumps of trees that have been cut down.

Branch of the Cinnamon Tree.

Where Found.— In the tropical islands of Asia, and in the West Indies, but it is chiefly produced in Ceylon, in gardens belonging to the government.

Preparation.— In Ceylon the young shoots are cut down twice a year. From these the bark is stripped in pieces about a foot in length. The outer and inner layers of this bark are scraped off, leaving a strip about the thickness of writing paper. These thin strips are exposed to the sun, and in drying roll up in the shape of quills. They are gotten ready for market by slipping the smaller quills inside larger ones, until rolls made up of several layers are formed. These rolls are tied up in bundles weighing many pounds, and are then ready for market.

Kinds of Cinnamon.— That from Ceylon is much the best, and is known as Ceylon cinnamon. It is costly and not easily obtained, except at a drug store. That sold by grocers is not cinnamon at all, but cassia.

CASSIA.

Cassia is obtained from a tree something like a cinnamon tree, but the bark is thicker, the flavor harsher and more biting, and the odor stronger. Both the pungency and the aroma are much less delicate and delightful than those of cinnamon. The cassia buds look a little like cloves, and are used by confectioners.

Where Found.— Principally in Japan and in China, so it is sometimes called Chinese Cinnamon.

How to Distinguish.— When ground, it is difficult to tell cassia from cinnamon. The ground can be easily distinguished from stick cinnamon by its coarseness and thickness, and also because it does not roll up in such small quills.

Branch of Clove Tree.

CLOVES.

Description.— Among the most important spices of the East are cloves. They are unopened flower-buds of a tree that grows to the height of from twenty to thirty feet. The round top of the clove is formed of the leaves of the flowers still rolled up. If left upon the trees these would have opened. (See picture.) Cloves are thought to look like nails, so in almost all languages they are called nails. The Chinese call them by a name which means a fragrant nail. The word clove comes from the Spanish word clavos, meaning nail.

Where Found.— Principally in the Spice Islands, which are their native soil. During the last century they have been cultivated in other islands of the Indian Ocean — among them Java, Sumatra and Zanzibar — and they have also been introduced into the West Indies; but nowhere else do they reach the same perfection as in the Spice Islands.

Preparation for Market.— The clove-trees bear a great quantity of small red flowers, which are gathered just before they are quite unfolded, and are dried as rapidly as possible, so that the aroma may not be lost. They are commonly dried by exposure to the air, but in the shade. Sometimes to hasten the process they are partially dried over wood fires. In drying, the beautiful red color changes to the dark brown color the clove has when it reaches us.

A STORY.

Until a few hundred years ago the people of Europe supposed the earth was flat and much smaller than it is. They knew little of the other countries of the world except those lying about the Mediterranean Sea, those of northern Africa and south-western Asia; and they knew less about the great seas. All the spices and other fine things from Southern Asia, that made their way into Europe, had to be carried over land to the Mediterranean. This took a long time and made the spices very costly; so that cloves, that were bought of the natives of the Moluccas for less than half a cent a pound, were sold in England for more than seven dollars a pound.

A few years after Columbus discovered America, the Portugese found that they could reach the rich island south of Asia by going round Africa. They found here a simple, happy, industrious people who were almost all engaged in the cultivation of their spices, especially of the clove. The Portugese took possession of the islands, kept out all other Europeans, bought all the cloves raised each year, carrying them off to Europe — which they could do very cheaply in their ships — and sold them for whatever they chose to ask. As there was no one to compete with the Portugese they could buy cheap and sell dear, so of course they made a great deal of money.

Naturally other nations in Europe would want to share in such rich possessions, but the Portugese had everything their own way for about a century. Then the Dutch succeeded in getting the Spice Islands into their hands and drove off the Portugese. They wished to raise cloves for as little cost as possible and sell them for as much as possible. They accordingly decided to confine the culture to the island of Amboyna, because, if great quantities were raised, it would make the spice cheap, and also because it would be easier to keep the natives from slyly selling their cloves to anyone else, if there was one island to look after instead of many.

To accomplish this end the Dutch did a very cruel and wicked thing. Each year they sent a band of

soldiers and workmen to all the other Spice Islands to tear up every clove tree that sprung up by chance. Nor was that all. They forbade the natives planting a clove tree, and if they found out that a man had planted one, or had sold so much as a pound of cloves, he was put to death. This caused the poor people great suffering, not only by depriving them of their only means of earning money, but also by depriving them of food. We have seen that these islands are of volcanic origin. The soil is light and easily washed away by the heavy rains of the region, unless it is protected by trees. So many clove trees were uprooted, that when the rainy season came on the surface soil was carried away to the sea. Or, if the land was flat, it was burned up in the dry season by the hot sun. The unhappy islanders saw whole stretches of fertile land becoming more and more sterile, until finally they could not raise food enough to live upon. Hundreds of them died of starvation. Some, to escape such a fearful death, were glad to become slaves in the clove plantations of Amboyna.

Although the clove tree is no longer uprooted in these islands, the cultivation of this spice has never revived, and Amboyna is still the principal source of supply.

Branch of Cayenne Pepper Plant.

PEPPER.

Description.— Pepper, as we have seen, is a *fruit*. The plant is not a tree, but a beautiful vine, that grows to a height of from twelve to twenty feet. When the pepper grows wild in a locality, the people cultivate it by tying the ends of the vines to trees about six feet apart, care being taken to select those which have a rough bark, so that the vines will cling to them. The underbrush is cleared away. If, instead of taking wild vines, other vines are set out, care is taken to plant trees near them, because the pepper is a plant that loves the shade and thrives best in it. When three or four years old, the vine begins to bear, and produces two crops annually for about twelve years. The fruit grows on a stem something like a currant.

Where Found.— In both East and West Indies.

Preparation for Market.— When ripe the berries are red. It is necessary that they should be full grown, but if allowed to fully ripen, they lose their pungency, so just as soon as a few berries on the vines are red the harvest begins. Some of the pepper-corns are simply dried; others are bruised and washed until the stems and outer covering are removed, and then dried.

Kinds of Pepper.— There are two kinds of pepper, white and black. That prepared by drying simply, is black pepper That prepared by removing the pulp is of a lighter color and is called white pepper. White pepper is more delicate than black, and is more costly on account of the greater labor required in its preparation.

Two other spices are called pepper that are not pepper at all. One is known as Cayenne pepper, the other as pimento, the Spanish word for pepper.

CAYENNE PEPPER.

Description.— Cayenne pepper is so called from a town in South America; it is often called red pepper from its color. The plant is very unlike the pepper vine, but is related to the red pepper of our gardens; the fruit of which grows in large, bell-shaped pods. There are many varieties of this plant. The one from which Cayenne

pepper is obtained has a small, long pod of a yellowish red when ripe.

Where Found.— It is a native of South America, but is now cultivated in southern Europe and in India.

Preparation.— The pods are allowed to ripen, are then dried, ground, mixed with yeast, and baked in small hard cakes, something like crackers. These cakes are ground up and furnish the red pepper of commerce. Sometimes pepper is prepared by simply pounding the dry pods.

Adulterations.— Cayenne loses its bright red color if it is long exposed to the light. To conceal this loss of color and also to conceal adulterations, such as rice and flour, poisonous mineral substances are sometimes mixed with it. Red lead, mercury and other harmful minerals are used for this purpose. It is difficult to obtain perfectly pure red pepper. Out of twenty-eight samples tested, twenty-four were found to be adulterated.

PIMENTO.

Description.— Pimento is the fruit of a tree something like a clove-tree. The fruit looks so much like pepper-corns that the Spaniards called it pimento when they found it in America; a name it still bears. It is sometimes called allspice by housekeepers, because its flavor is thought to be like that of the spices, nutmeg, cinnamon and clove, mixed.

Where Found.— In South America and the West Indies, especially in Jamaica.

NUTMEG AND MACE.

Description.— The nutmeg is the seed of a tree that reaches a height of about twenty-five feet. The fruit when ripe is of a yellowish color and resembles a roundish pear in appearance. As the fruit is very hard it is not eaten except when preserved. When ripe it bursts open and exposes the nutmeg encased in a curious red covering called the aril. Ground, the aril forms the spice known as mace. Within the aril is the nutmeg enclosed in a shining brown shell.

Where Found.— Originally in the Spice Islands, and for a long time no where else, because the Dutch would not allow nutmeg trees to be carried to any other part of the world for culture. The British got possession of these islands for a time, and then the trees were introduced into the islands of the Indian Ocean and into India. Now, nutmegs are also raised in South America and in the West Indies.

Preparation for Market.— After the aril is removed, the nuts are dried for about two months over very slow fires. When sufficiently dried they rattle about freely in their shells. These are cracked open with a mallet, the nuts are packed into chests, sometimes with and sometimes without lime, and are then ready for market.

The Dutch began the custom of rubbing the nuts in lime to prevent sprouting. They did not do this simply to prevent injury to the spice, but also to prevent the nutmeg trees being carried to any other country by means of the nutmegs. It is now known that exposing them to the sun for a short time will prevent their sprouting. Those that are not limed are considered better than those that are.

How to tell Good Nutmegs.— Wild nutmegs are very inferior to the cultivated but are sometimes sold. They are easily detected from the fact that they are about twice as long as the others. Nutmegs are frequently worm-eaten; to conceal this the worm-holes are filled up; but such nutmegs are very light. If a grocer gives you too many for a pound, take care: they may not be good. A really good nutmeg is hard, solid, and when pricked with a pin sends out upon the surface a little bit of oil.

SUGGESTIONS.

Have each member of the class come to school provided with the spices named in the lesson.

If possible, represent with colored crayons upon the black-board a ginger plant, a pepper-vine and a cinnamon, a clove, a nutmeg, and a pimento tree.

Branch and Fruit of Nutmeg Tree.

It would be well to represent them all by the same scale, say an inch for a foot. Then the picture of the ginger-plant will be four inches high, that of the cinnamon tree about thirty, etc. Write the name of the plant over each picture. From the specimens brought in, these pictures and their maps, you will be able to teach the children everything under that headed "Matter." Do not attempt to teach too much in a single lesson. There is material enough here for several lessons. Teach by questions.

MODEL.— (First Topic.—Spices.)

Children, you may look at the things you have brought in for this lesson. Who can tell me what we call them? We want to find out just what spices are. Look at these pictures, what does this one represent?— pointing to the pictures one after the other upon the board — Are spices animal or vegetable substances? Smell of those you have, what can you tell me about their odors? (All sorts of answers will of course be given, such as good, nice, sweet, fragrant, agreeable, etc. If an unexpressive adjective is used by a child substitute a better one. When the children come to see that the spices have agreeable or fragrant odors, give them the term aromatic. In the same way teach pungent. Let one child after another put the things taught together until a statement something like the following is given. "Spices are vegetable substances which are aromatic and pungent, and which are used to flavor our food," or "Spices are aromatic and pungent vegetable substances, used to season food.")

Let the children name some things which are aromatic, but not pungent, as coffee; some which are pungent but not aromatic, as mustard, and tell whether or not they are spices.

In teaching the next topic let them discover for themselves, by examining their specimens and the pictures, that ginger is a root, cinnamon a bark, etc. In fact, teach everything by making them *see* what is true, not by *telling* them.

—Elvira Carver.

ONION, TURNIP, CARROT.

(*A Comparison*).

Raw and cooked specimens for illustrations.

I. Onion.—Call attention to the shape, the thin brown skin, the strong odor, and the hot, burning taste. Cut open to show the leaf-like layers: show thread-like roots. Compare with a cabbage or with a lily-bulb.

II. Turnip. — In shape something like the onion; thick skin. Cut open to show solid flesh. Skin has hot taste, flesh sweetish.

III. Carrot.— Elongated shape, thin skin. Cut open to show the yellow and red parts. Sweet taste. Turnips and carrots are roots. Show the little rootlets.

IV. Comparison.— The children to be led to make this for themselves.

Onion	*Turnip*	*Carrot.*
Ball-shape (?)	Ball-shape (?)	Long.
Thin skin.	Thick skin.	Thin skin.
Layers.	Solid	Solid.
Roots like thread.	A tap root.	A tap root.
Hot, burning taste.	Sweetish taste.	Sweet taste.
Strong odor.	Odorless.	Odorless.

TOPICAL OUTLINE FOR GEOGRAPHICAL LESSON.

THE CONTINENT.

Topics Presenting a Continent as a Whole.

a. Form.
b. Introduction.
c. Size.
- Greatest Length.
- Greatest Breadth.
- Area.

d. Position.
- Latitude.
- Longitude
- Boundaries.

Topics Presenting the Parts of a Continent.

1. Outside and on the Coast.
   a. Divisions of Water.
   - Oceans.
   - Seas, etc.

   b. Divisions of Land:
   - Islands.
   - Peninsulas.
   - Capes.
   - Isthmuses.

2. Inside the Coast,
   a. Divisions of Land, or Highlands and Lowlands.
   b. Divisions of Water, or River Systems.

Topics Relating to the Life Upon the Continent.

a. Climate.

Causes that affect:
- Latitude.
- Elevation of the Land.
- Slope of the Land.
- Nearness to the Sea.
- Prevailing Winds.
- Ocean Currents.

b. Productions of Different Sections.
Fertile and Sterile Sections — Productions.
c. Animals Useful to Man.
d. Occupations Carried on in Different Sections,
e. Exports and Imports.
f. Great Thoroughfares.

Water Communications: Natural. Artificial.

Railroads.

g. Important Towns.
Along these Routes.
Manufacturing Towns.

h. People. *i.* Political Divisions of the Continent.
Races.
Religion.
Government.
Advance in Civilization.
History.

Town.

- Map.
- Length, Breadth.
- Boundaries.
- Coast.
  - Oceans.
  - Seas.
  - Gulfs, etc.
- Weather.
- Fertile Lands.
- Things that Grow.
- Interior.
  - Mountains.
  - Plains.
  - Rivers.
  - Lakes.
- Industries.
- Railroads.
- Villages, Cities.

— Elvira Carver.

EMPLOYMENT FOR GEOGRAPHY CLASS.

For a class in elementary geography the following plan will sometimes bring peace to the weary teacher.

Let the teacher place a diagram on the board, as the following:

No.	Name.	Abv.	Capital.	Largest City.
1.	Alabama.	Ala.	Montgomery.	Mobile.
2.	Arkansas.			
3.				

Have the pupils draw the same form on their slates, *using their rulers*; in the first column, tell them to place the numbers 1 to 38; in the second, the States in alphabetical order; have the other columns filled out as indicated. Correct the work in the class; then give them paper and have the table reproduced. The schedule or table should then be copied into blank-books.

Lastly, the table should be learned perfectly, so that the teacher may give out any one of the words in the four columns, and the pupil could give you the corresponding names.

Example: The teacher propounds "San Francisco," and the pupil answers: "California, Cal., Sacramento," etc. During the time required to learn the tables, other slate work could be given. Use the same form, but tell the scholars to arrange in the first column the Capitals in alphabetical order, and fill out the other columns accordingly. Then the table would commence thus:

"1. Augusta, Me., Maine, Portland."

OUTLINE FOR PHYSICAL GEOGRAPHY.

WHAT physical Geography is as compared with what we ordinarily call Geography.

THE EARTH.

Of itself,
In the solar system,
In the universe.

EARTH'S SURFACE.

Elevations and depressions,
Geologically,— how formed,
Effect on drainage,
Effect on oceanic movements,
Distribution of heat,
Laws of rainfall.

IN THE SOLAR SYSTEM.

Sun.—Planets.— number,— size,— distances,— moons,— meteors.— comets.
Movements. — Kinds, — axis, — orbits,— directions,— velocities.

IN THE UNIVERSE.

Starry heavens,
Fixed stars,
Nebulæ,
Seeming and real distances.

THE EARTH.

Form, general and exact,
Comparative size,
Circles— equator,— meridians,— parallels,— climates,
Latitude and longitude,— how reckoned,— length of a degree,— prime meridian.

MAGNETISM.

Kinds of magnets,— properties,
Magnetic poles,— neutral line,
Dip of the needle,— variations diurnal and secular,
Magnetic meridians,— line of no variation,
Magnetic Storms,— causes, thermo-electric currents,
The compass.

INTERNAL HEAT.

Mines,
Artesian wells,
Hot springs and geysers,
Volcanoes,
Earthquakes,
Two theories as to internal condition of the earth (fluidity or solidity).

ARTESIAN WELLS.

Why the water rises,
Depth.

GEYSER.

Geyser regions,— description,— causes,—water to be thrown out.

VOLCANOES.

Formation,— height,— kinds,— active,— extinct,
Parts { cone, lava, crater, chimney.

ERUPTIONS.

Periods,
Premonitions,
Atmospheric warnings.

PRODUCTS.

Material thrown out,— how much,— how far,— cities buried.

EARTHQUAKES.

Centre — movements { waving, vertical, rotary.
Duration,— area,— causes,— relation to volcanoes.

CRUST OF THE EARTH.

Composition.
Formation.
Rocks— Water rocks,
Fire rocks,
Metamorphic rocks.
Geological ages.— Azoic,
Silurian,
Devonian,
Carboniferous,
Reptilian,
Mammalian,
Age of Man.

ELEVATIONS AND DEPRESSIONS.

Mountains.— How formed,— groups,— chains.
Valleys.— How formed,— canons.
Plateaus.—How formed,— situations,— productions.
Plains. — Elevation, — surface, — kinds, — productions.
Prairies. — Llanos,— selvas,— pampas,— steppes, heaths.

ISLANDS.

origin,—kinds { continental / oceanic
Oceanic.—Volcanic,
Coral.
Continental.—Situation,
Character of soil and rock.

WATER.

Fresh,— salt.
Physical Properties,—Changes form,— expands on freezing,—great capacity for heat,—great solvent power.

LAKES.

Origin.— Offices.

RIVERS.

Sources. Lakes,
Springs,
Glaciers.
Change the surface of the earth by
Offices.—Evasion,
Transportation,
Deposit { bars / deltas
Rapids,
Cataracts,
Drain the land.

OCEAN.

Branches,
Depth,
Bed of the ocean.
Islands,
Waves.
Tides,
Currents,

WAVES.

Crest,
Trough,
Ordinary height,

Movement—velocity.
Forces,—breakers,—surfs,—swells.

TIDES.

Cause.— Flood and ebb,
Tidal wave.— Origin,
Direction,
Velocity,
Height.

MARINE CURRENTS.

Origin,
Causes,
Equatorial,—polar,—return
Offices,
Sargossa seas.

ATMOSPHERE.

Height,
Composition,
Elasticity,
Density,
Movements.

CLIMATE.

Modified by elevation,—soil and vegetation,—prevailing winds,—bodies of water,—ocean currents,—length of day.

WINDS.

Causes,—currents,—calms,—trade-winds,—periodic winds,—monsoons,—land and sea breezes,—local land winds.

STORMS.

Velocity of winds,
Causes,
Kinds,—cyclones,—rotary,—progressive,—whirlwinds,—tornadoes,—water spouts,—typhoons.
Predictions of storms.

MOISTURE OF THE AIR.

Amount,
Evaporation,
Condensation,
Dew,—frost,—fog,—clouds,—rain,—hail,—snow,—these how formed?

CLOUDS,

Simple.—Armies,
Cumulus,
Stratus.
Compound.—Any two of the above combined.
Height.—How sustained,—velocity,—movement.

GLACIERS.

Formed,—size,—motions,—moraines,—icebergs.

DEVICES IN GEOGRAPHY.

TWO popular questions for written examinations are, "Name the States on the eastern bank of the Mississippi River;" and "Name the States on the western bank of the Mississippi." It is very easy for children to become confused over these questions. I found a suggestion some years ago in the "St. Nicholas," that proved very pleasing and helpful in teaching one of these answers. It was a map of "Uncle Sam." It was formed of the States on the western bank of the Mississippi. He was supposed to be bathing his feet in the Gulf of Mexico. Minnesota represented the hat; Iowa, the head; Missouri and Arkansas, the body; Louisiana, the foot and leg. Being a side view of "Uncle Sam," but one foot and leg was visible. A city represented the eye, and cities represented the buttons on the coat. Bends of the Mississippi formed the nose and mouth, and other rivers marked off the arm. My pupils enjoyed drawing "Uncle Sam," and, in that way, became quite familiar with the location of the States.

I saw a game of cities not long ago that pleased me very much. It was like the well-known game of authors, only a country and three or four of its important cities formed a book, instead of an author and some of his works. On each card of the book was an outline of the country, with the cities mentioned located upon it. Only enough rivers were drawn for the location of the cities; the eye was not confused by details. It occurred to me that a pupil could make such a game for himself, and that it would furnish excellent busy work for a grammar school. In almost every class there are some bright pupils, who learn their lessons much more readily than the majority of the class, and consequently have the temptations to mischief that idleness affords. Possibly the manufacture of such a game might please the

fancy of such pupils, and furnish legitimate and instructive occupation. I saw a device at a study class one evening that I thought would be helpful in a school-room in teaching pupils the sometimes difficult lesson — attention. The teacher gave the class a list of questions, which they copied, and which they were to answer at the next meeting. In the reading that followed, given by the teacher, the attentive listener found the answers to many of the questions. It was a taste of the game of hide and seek, for the listeners sought for the answers that were sometimes partially concealed in the reading.

For a review lesson, when perhaps more time can be given to the recitation than usual, the following exercise may be pleasant and profitable:

The class is divided into several sections. One section is supposed to be travellers; the others, people living in different places, whom the travellers visit. Those who receive must, of course, entertain their guests by showing them the attractions of the cities in which they live. The travellers, in turn, must describe their journey. For instance, let the journey be from Boston to Washington. Let the travellers visit friends in New York, Philadelphia, Baltimore. Those receiving at New York will take their guests to Central Park, Trinity Church, to a drive on Broadway, a walk on Fifth Avenue, etc. At Philadelphia, Falmouth Park, the Mint, Independence Hall, Girard College will be among the points of interest. At Baltimore, the Washington Monument and the Battle Monument, which have given the city the name of "Monumental City," must be shown to the guests. The parts of the city through which the Northern soldiers passed at the opening of the Rebellion, will also be interesting. A bright and enthusiastic pupil will find many other attractions in these cities, and in Washington, the destination of the travellers. The guests can mention the cities through which they have passed on their journey, the rivers crossed, the mountains seen, the railway route, and the line of steamers chosen. This exercise may be conducted by means of essays, or by oral recitation, as the teacher thinks best. A modification of the game called in the *Chautauquan*, "Throwing Light," is pleasing for a geography lesson. I suggested such an exercise for the history class. One pupil describes a country or city, without giving its name. As soon as the name is discovered by the pupils, they add facts concerning the place, also withholding the name. When the subject is exhausted, the name may be given in concert.

—Evelyn S. Foster.

GEOGRAPHICAL NAMES.

Perhaps some of the queer names in the geography will seem more interesting and be easier to remember if you know what they mean.

Colorado means red or colored: Chimborazo means chimney; Chili, land of snow; Chesapeake, great waters; Cayuga, long pond; Jerusalem, place of peace; Santa Fe, holy faith; Bombay, good harbor; Irawaddy, great river; Nova Scotia, New Scotland; Missouri, muddy; Mediterranean, middle of the land; Minnehaha, laughing water; Mississippi, great water; Dwina, double river; Cork, marsh; Arizona, Sand Hills; Bayou, a creek; Azores, hawks; Beb-el-Mandeb, gate of morning; Catskill, cats' creek; Elbe, white; Fond du Lac, end of the lake; Costa Rica, rich coast; Polynesia, many islands; Montreal, royal mountain; Patagonia, clumsy feet; Liberia, free; Katahdin, highest place; Java, rice; Hapti, high land; Glasgow, dark ravine; Cumberland, a land of hollows; Cairo, victorious; Cape Verde, green cape; Asia, the east; Florence, flowery city; Kansas, smoky plain; Santa Cruz, holy cross; Kennebec, long lake.

NOTES OF

"A TALK ABOUT OUR EARTH."

IN teaching Geography to beginners, it is well to have in the first place half a dozen oral lessons, taking up places near at hand, and bringing before the class *examples* of what is said. Don't let them waste their time learning "by heart" words of whose meaning they have not the slightest idea. Rather give them a few practical talks, allowing them to tell what they know of the subject brought forward.

The following is a lesson that I gave my class a short time ago:

Teacher.— Who can tell me what Geography is about?

[Hands are raised, and one of the children is called on for her answer.]

Louise.— Geography teaches us about the earth.

Teacher.— That is right. Now let us look around us, and see what we can find. But in the first place, who can tell me the shape of the earth?

Stearns.— It looks flat.

Amy.— The earth is round.

Teacher.— Amy is correct. Now who can tell me what makes our day?

George.— The earth turns round.

Teacher.— It turns on its axis once in twenty-four hours, and that makes our day and night. (Illustrate with a ball or apple.)

Bertie.— I thought that the sun moved round the earth.

Teacher.— It does appear so. Where is the sun in the morning?

Susie.— In the east.

Teacher.— And at night?

Oscar.— In the west.

Teacher.— Does the sun move around the earth then?

Louise.— No, ma'am. You told us one day that the earth moved around the sun.

Teacher.— I am glad you remembered. How long does it take for that journey?

A puzzled look sweeps over the class, so a hint is thrown out that it takes 365¼ days, about.

Berta.— I think it takes a year.

Teacher.— Just a year, and that makes our different seasons, as the sun strikes our earth in various ways. What seasons do we have in a year?

Amy.— Spring, Summer, Autumn and Winter.

The path of the earth around the sun should here be shown with crayon, as this will illustrate the fact better than any other way.

Teacher.— Who can tell me what an island is?

Cora.— It is a small body of land with water all around it.

Teacher.— How many have ever seen an island? Every hand is raised.

Frankie.— I saw one in the grove where we had a picnic this summer.

Cora.— I saw one in the river.

Teacher.— Who can tell me what is found on islands?

Stearns.— Trees grow there.

Berta.— Flowers grow there.

Amy.— I saw an island once with a house on it.

Teacher.— Some islands have many houses. Now the large bodies of land are called continents. What are they?

Louise.— North America and South America.

Oscar.— Asia and Africa and Europe.

Teacher.— One more, a place where gold is found.

George.— Australia.

Teacher.— What is there beside land on the surface of our globe?

Amy.— Water.

Teacher.— Yes, and there are five great oceans. What are they?

Susie.— Arctic, Antarctic, Indian, Pacific, Atlantic.

Teacher.— Very good. Now is the water in the ocean good to drink?

Oscar.— No, ma'am.

Teacher.— Why not?

George.— Because it is salt.

Teacher.— If we look out of the windows, what can we see?

Stearns.— We can see hills.

Teacher.— What is a mountain?

Amy.— A very high hill.

Teacher.— Who can name any mountain?

Louise.— Mt. Washington.

Teacher.— Yes, that is one of the White Mountains in New Hampshire. Do we live in New Hampshire?

Class.— No, ma'am.

Teacher.— Where do we live?

Susie.— In Massachusetts.

Teacher.— What is the capital of Massachusetts?

Louise.— Boston is the capital.

Teacher.— Who knows the capital of the United States?

Louise.— It is Washington.

Teacher.— Yes, Louise knows, because she used to live there. Can you tell me the names of any rivers?

Frankie.— I live near the Charles River.

Amy.— My brother showed me the Mississippi River on the map one day.

Louise.— We crossed the Potomac River once.

Teacher.— Who can tell me where the rivers begin?

Nobody seemed to know, so the teacher explained that they sometimes commence from little springs up on the mountains, and that other little streams joined the first, until finally there was a river.

A map of the United States hung on the schoolroom wall, and after the children had told what they knew about their own country, the class was called forward, while one of the boys took the pointer and pointed out on the map different places. When he hesitated, another took his place. For variety, one of the scholars dictated instead of the teacher.

Some of the places pointed out were: the largest State in the Union; the smallest State; Massachusetts; Boston; Washington; Atlantic Ocean; Mississippi River; Gulf of Mexico; Mexico, etc.

After the class has recited this, a few of the leading questions may be put on the board and they may write out the answers on their slates. While doing this work, great care should be taken that every question is answered by a complete sentence. This will not only be a good test on what has been recited orally, but will also serve as a Language Lesson. If possible, take your children to walk after school some night, and point out the interesting things close at hand. Influence them so that they will behold what Nature spreads out before them, and in this way their dreaded Geography may have a fascination for each one.

— Cora W. Foster.

GEOGRAPHICAL PERSPECTIVE.

The following remarks will be found useful in the study of geographical perspective:

1. The pupil should pay more attention to his own State than to any other.

2. His own country should have precedence over all other countries.

3. Of foreign countries he will study those with the greatest care with which his own State and country are closely connected by industries, commerce, intellectual, political, and moral life.

4. Next may be mentioned the present standing of countries in the scale of civilization, — their position in the march of progress.

5. Historical relations will follow; facts of race, descent, emigration, and social and legal institutions.

6. The place of countries in history and literature.

7. Other things being equal, the near will claim more attention than the remote.

— B. A. Hinsdale

NOTES OF LESSON ON

WIND.

TEACHER. — What have I in my hand?

Pupil.— A whirl-i-gig.

Teacher.— You can make a toy like this very easily. After school-hours I will show you how to make one. [Cut a square sheet of paper from the corners nearly to the centre and fasten one side of each divided corner through the centre of the paper to a stick.] What makes this toy whirl around?

Pupil.— The air.

Teacher.— When I hold it still it does not turn around.

Pupil.— It will if you hold it in the wind.

Teacher.— Is wind air?

Pupil.— Wind is air in motion.

Teacher.— I see a picture in my mind; as I tell about it, try to form one like it in your mind. The branches of the trees sway and bend toward the east. The dust whirls along the street in clouds. An old lady is walking along very rapidly, in fact, she cannot seem to go slowly; occasionally she turns and walks backwards, her garments cling to her form, and away goes her umbrella turned wrong side out. The hens are running in all directions and their feathers seem to stand up straight. Bits of paper go whirling through the air and a boy is running after his hat. What shall I name my picture.

Pupil.— A windy day. I can see it just as you did.

Teacher.— I am glad to know that, for mental pictures are often more beautiful than oil paintings. I will now make a picture on the blackboard. (Teacher sketches a rude outline of a house, and with red crayon represents flames coming through the roof.) What have we here?

Pupil.— A house on fire.

Teacher.— What have you learned about hot air?

Pupil.— We have learned that hot air rises.

Teacher.— As the flames heat the air near the house what movement will the hot air make?

Pupil.— It will rise far above the house.

Teacher.— What will take the place of hot air?

Pupil.— Cool air will rush in and take its place.

Teacher.— You can now tell why the wind blows harder when a house is on fire than at other times. In what other way is the air heated?

Pupil.— By the sun.

Teacher.— Yes, the sun heats the earth and the earth sends back the heat into the air. If the air was everywhere of the same degree of heat would there be wind?

Pupil.— I think not, unless it blew upward to the sky.

Teacher.—We find that the air is not everywhere of the same degree of heat. What have you learned about the air on the top of high mountains?

Pupil.— We have learned that the higher we ascend the cooler the air becomes.

Teacher.— The land takes more heat from the sun than the water does; but cools off quicker. During the day which would be the cooler, the ocean or the land?

Pupil.— The ocean.

Teacher.— Which would be cooler near evening?

Pupil.— The land.

Teacher.— Why?

Pupil.— Because the land cools off quicker than the ocean.

Teacher.— From which then would the warm air rise near evening?

Pupil.— From the water.

Teacher.—Would the wind blow *from* the water or *toward* the water near evening?

Pupil.— Toward the water.

Teacher.— Why?

Pupil.— Because the cool air must blow from the land to take the place of the warm air rising from the water.

Teacher.— What would be a good name for a breeze blowing from the land.

Pupil.— I should call it a land breeze.

Teacher.— During the day does the wind blow *from* the ocean or *toward* the ocean?

Pupil.— It blows from the water.

Teacher.— Why?

Pupil.— Because the earth is warmer than the ocean and the cool air must blow from the water to take the place of the warm air rising from the land.

Teacher.— What is a good name for a breeze blowing from the sea?

Pupil.— Sea breeze.

Teacher.— Is wind of any use?

Pupil. — It helps vessels along and turns machinery.

Teacher.— It drives away foul odors and keeps the air pure. It also acts like a mother and takes the white-robed vapor in its arms and carries it over the earth. We shall find that currents of air are constantly travelling to and fro.

Pupil.— I should think they would run against one another.

Teacher.— One breeze often meets another face to face and then they have a squabble and stir up a regular whirlwind.

Pupil.— I have seen a whirlwind in the street. The leaves flew round and round.

Teacher.—You may have seen a very small whirlwind, but when a strong wind meets another strong wind they wrestle together and sometimes move along for miles, tearing up trees, overturning houses and doing much damage.

Pupil.—Is a whirlwind a cyclone? I have heard father tell about cyclones.

Teacher.— When a whirlwind travels in a line more or less curved it is called a cyclone. I will read you a brief account of a cyclone that swept through a western town not long since. (Teacher reads from a newspaper.)

Pupil.— That was terrible. I have heard father say that in some States the people build cyclone cellars in which to hide when they see a cyclone coming,

Teacher.— That is true, and precautions of that kind have no doubt saved many lives. Fancy a whirlwind on a sandy desert.

Pupil.— It makes the sand fly.

Teacher.—Yes, and it takes the sand in its arms and forms what is called a sand spout. Here is a picture of one.

Pupil.— Does that thing dance along over the desert?

Teacher.— Yes, very rapidly. Fancy a whirlwind on the ocean.

Pupil.—Does it take up the water as it does the sand?

Teacher.— Yes, and what shall we call it?

Pupil.— A water-spout.

Teacher.— I will draw the picture of one on the black-board. It seems to tie the sky and ocean together.

Pupil.— What if a water-spout should strike a vessel?

Teacher.—The sailors would be likely to get wet, if nothing more serious happened. Sometimes when they see one coming they discharge a gun at it, and thus cause it to burst before it reaches the vessel.

You may now take your slates and copy what I write on the black-board. (Teacher writes the following topics:)

Wind.

1. Cause.
2. Uses.
3. Sea Breezes.
4. Land Breezes.
5. Whirlwind.
6. Cyclones.
7. Sand-spouts.
8. Water-spouts.

At your seats you may write all you can about each of these topics, and after your work has been corrected you may copy it into your blank-book and illustrate your little story with pictures like these I have made on the black-board.

The permission to illustrate their written work with colored crayon sketches will be highly appreciated by the children, and they will soon learn not only to reproduce the blackboard drawings, but also to attempt original illustrations.

—ELIZA H. MORTON.

NOTES OF LESSON ON

VAPOR.

(TEACHER EXPERIMENTS BEFORE THE CLASS.)

TEACHER.— What did I do just now?

Pupil— You poured water into a small vial and closed its mouth with a cork through which is a bent glass tube. You then held the vial over the flame of a candle.

Teacher.— What was the result?

Pupil.— Steam came from the tube.

Teacher.— What was left in the vial?

Pupil.— Nothing but air.

Teacher.— We will call the steam *vapor*. Can you give other instances of water turning to vapor?

Pupil.— When water boils steam comes from the vessel.

Teacher.— What makes the vapor rise from the boiling water?

Pupil.— The heat of the fire.

Teacher.— Does vapor ever rise from the earth?

Pupil.— I think that fog is vapor, and fog rises from the earth.

Teacher.— What makes fog rise from the earth?

Pupil.— I think it must be the heat of the sun.

Teacher.— You think correctly. When water passes off in vapor we say that it *evaporates*. We need a word to name the process of turning into vapor. Can you give one?

Pupil.— Vaporation.

Teacher.— Evaporation is a better word. Evaporation is hastened by heat. Can there be vapor in the air and we not see it?

Pupil.— I do not know, but I think not.

Teacher.— When your mother hangs wet clothes on the line they soon become dry. Where does the water go?

Pupil.— I think it must evaporate.

Teacher.— It does evaporate. Can you see the vapor as it rises from the clothes?

Pupil.— Sometimes they steam a little, but not often.

Teacher.— When you write with a pen and ink the water in the ink soon dries, leaving the dark part of the fluid on the paper. Can you see the vapor as it rises from the paper?

Pupil.— I cannot.

Teacher.— The sun acts like a great pump, forever drawing up water from moist bodies. Sometimes we can see the moisture in the air, and sometimes we cannot. Who can explain this?

Pupil.— Will you please tell us about it?

Teacher.— In a previous lesson you have been taught the effect of heat upon air. Do you remember?

Pupil.— We have learned that heat expands or swells air.

Teacher.— That being the case, which will hold more moisture, warm air or cold air?

Pupil.— Warm air.

Teacher.— Very hot air dries up moisture. When warm moist air comes in contact with cool air the particles of moisture are pushed together so as to be seen. Did you ever see moisture from your breath?

Pupil.— In a cold day I have noticed that steam seems to come from my mouth.

Teacher.— Did you ever breathe on a cool pane of glass?

Pupil.— Yes, often, in order to see it steam over or become wet.

Teacher.— Perspiration or sweat is continually forcing its way through the pores of the skin. Can it always be seen on the face?

Pupil.— No, very seldom.

Teacher.— Perhaps you can tell why fog is often seen near the sea-shore in the morning?

Pupil.— I think that the air above the land

must be cooler than the moist air that rises from the water.

Teacher.— That is true. Large bodies of water do not cool off as much during the night as the land. What have you learned about the Gulf Stream?

Pupil.— I have learned that it is a warm current of water in the ocean, issuing from the Gulf of Mexico.

Teacher.— Find Newfoundland on the map, and notice the ocean currents near it.

Pupil.— The Gulf Stream is near Newfoundland, and cold currents from the north strike this stream near Newfoundland.

Teacher.— How would that be likely to affect the atmosphere near the island?

Pupil.— I should think it might be foggy there.

Teacher.— No other part of the world is so foggy as the Grand Banks of Newfoundland. Find on the map the very warm countries of the earth.

Pupil.— They are in the Torrid Zone.

Teacher.— Would you be likely to find much fog where the air is very hot and where there are no large bodies of water?

Pupil.— You told us that very hot air dries up moisture.

Teacher.— I think you can now point to some regions on the map where vapor can often be seen in the air.

Pupil.— I think England must be a foggy country, for the Gulf Stream is very near it, and the island is quite far north.

Teacher.— The City of London has such dense fogs that sometimes the inhabitants are obliged to carry lanterns in the day-time, and it is dangerous to attempt to cross the streets.

You may think about this lesson and write what you can about VAPOR. Bring your papers to me at the next recitation hour, when we will have a nice talk about CLOUDS, which are only masses of vapor high in the air.

When a written exercise of this kind is required, it is well to outline the lesson on the board with topics. These will help the children to remember what has been taught, and will enable them to arrange their thoughts in a systematic manner in writing.

—ELIZA H. MORTON.

NOTES OF LESSON ON

CLOUDS.

TEACHER. — What name have you learned is applied to vapor high in the air?

Pupil.—We have learned that vapor high in the air is called a cloud.

Teacher.— Did you notice the clouds as you came to school this noon?

Pupil. — I did. They were very large and white. Some looked like mountains, and one looked like a great alligator.

Teacher.— The sailors call the clouds that you saw "balls of cotton." What have I in my hand?

Pupil.—You have a cotton ball in your hand.

Teacher. — What have I done to the cotton ball?

Pupil. — You have picked it out fluffy and you are holding it against the blackboard. It looks just like the clouds I saw.

Teacher. — I think we can draw something that will look like those clouds.

(Teacher makes a rude sketch on the blackboard.)

Teacher. — How far from the earth did those clouds appear to be?

Pupil. — I think they were a hundred miles away.

Teacher. — They were probably not more than the distance from here to Morrill's corner. How far is that?

Pupil.—It is about two and one-half miles.

Teacher. — The *highest* clouds are not much higher than the highest mountain. Do you remember about that?

Pupil. — Mt. Everest is the highest mountain. It is about five miles high. When we talked about mountains you told us of a man who when climbing a mountain saw a cloud far below him.

Teacher.— You have a good memory. People when sailing in balloons often float into clouds. Do you think that pleasant?

Pupil.— I think it must be foggy and cold. When we talked about air we learned that the higher up we go the colder it is.

Teacher.—That answer tells me that you have been *thinking*. Now can you think why some clouds are higher than others?

Pupil.—I think it must be because some clouds are lighter than others for we have learned that the lighest objects in the air rise the highest.

Teacher.— That was well said. Clouds rise in in the air. Do they move in other directions?

Pupil. — I have seen them chase one another across the sky.

Teacher.— What made them do that?

Pupil.— I think the wind must have blown them about.

Teacher.— Yes, there are currents of air above the earth. Look from the window now and tell me what kinds of clouds you see.

Pupil.— I see heavy, black looking clouds.

Teacher.— What is a good name for these clouds?

Pupil.— I should call them rain clouds.

Teacher.— They have another name, but the one you gave will do very well.

Pupil.— Will you please tell us the other name?

Teacher.— The other name is *nimbus*, which is a Latin word meaning rain cloud. When you see clouds of this kind what do you expect?

Pupil.— We expect it will soon rain.

Teacher.— Sometimes clouds are arranged in straight bands like these. (Sketching on the black-board.) This cloud is called the stratus. You can remember that word, for the bands are straight, and stratus sounds like straight. When we talked about mountains we learned something about Table mountain that was interesting; do you remember?

Pupil.— We learned that often just before a storm a white cloud settles over the top of that mountain, and the people say that the evil one is spreading his table cloth.

Teacher.— That cloud is not a stratus but it spreads itself quite nicely over the table. The curl clouds are highest of all. (Sketching on the black-board.) You see they look like curls of white woolly hair. How high are they?

Pupil.— (Very triumphantly, with a confident tone, thinking of Mt. Everest.) They are more than five miles high.

Teacher.— That is correct. When do we see the brighest and most beautiful clouds?

Pupil.— I think at sunset the clouds are most beautiful.

Teacher.— Do the clouds put out the light of the sun?

Pupil.— They hide it so we can't see it.

Teacher.—Yes, but "behind the clouds the sun is always shining." I heard some one say the other day that a kind word is like a rift, or opening in a cloud that lets the sunshine through. Can you tell how that is?

Pupil.— I think it means that we like to hear a kind word just as we like to see the sunshine.

Teacher.—Yes, the sunshine is warm and cheering, and a kind word makes us feel happy and cheerful. We will form a picture in our minds. We will imagine that the sun is setting and that we are in a boat on the water. The sky is tinged with crimson and gold, and the water reflects the brightness like a mirror. In the distance is a high

rocky coast, so far away that we can hardly tell the rocks from the clouds for they look like great rocks in the sky. Our boat seems to be floating on another sky, for the water below shines like the sky above. Do you see all this?

Pupil.— I do.

Teacher.— Tell me about it.

Pupil.— We are in a boat on the water. It is sunset and the water looks just like the sky and the sky is all shiny. There is a land way over there that looks just like the clouds.

Teacher.— Keep the picture in your mind and repeat after me. (The teacher reads the following verses, the children repeating in concert.)

"The golden sea its mirror spreads
Beneath the golden skies,
And but a narrow strip between
Of land and shadow lies.

The cloud-like rocks, the rock-like clouds,
Dissolved in glory float,
And midway of the radiant flood
Hangs silently the boat.

The sea is but another sky,
The sky is sea as well,
And which is earth and which the heavens,
The eye can scarcely tell."

Teacher.— I will write these pretty lines on the board and you may copy them into your blank books. Read them over several times and notice how nicely they describe the picture we saw.

— ELIZA H. MORTON.

NOTES OF LESSON ON

RAIN.

TEACHER.— What have I in my hand?

Pupil.— You have a sponge in your hand.

Teacher. — How am I holding the sponge?

Pupil.— You are holding it very tightly.

Teacher. — We will compare this sponge to a cloud. When a cold wind strikes a cloud it compresses this sponge. We will fill the sponge with water and call it a cloud filled with moisture. My hand we will call a cold wind, which strikes the cloud. What is the result?

Pupil.— The water falls from the cloud to the earth.

Teacher.— The water that I press from this sponge does not fall like rain, but if I stood on the top of a very high tower and pressed water from a very large sponge, the water would be in the form of rain by the time it reached the ground. Can you think of any other way that a vapor-charged cloud can become cooled? (Sketches a mountain on the black-board.) The wind is driving a cloud toward this mountain. It cannot go through it and so it rises and tries to float over it. What have you learned about the air on the top of high mountains?

Pupil.— We have learned that it grows colder the higher up we go.

Teacher. — How about our cloud, when it reaches the top of this mountain?

Pupil.— I think it will lose its moisture.

Teacher.— Yes, and the countries this side of the mountain will be well watered. The wind passes over the mountain, but leaves its moisture behind. If the wind blows in this direction for any length of time, what do you think will be the condition of the countries on the other side?

Pupil.— I think they will all dry up, for they will have no rain.

Teacher.— Perhaps we can find some such regions on the map. We have learned about winds that blow constantly in one direction.

Pupil.— The trade-winds.

Teacher.— Yes. (Pointing to the map.) The Andes Mountains lie directly across the path of the trade-winds. What must be the effect?

Pupil.— The moisture must fall on this side of the mountains. (Pointing to the map.)

Teacher.— Notice the streams that rise in the Andes and unite to form the Amazon. These are caused by the copious rains. What may we expect to find on the western slope of the Andes?

Pupil.— I think it must be a dry region.

Teacher.— (Pointing to the map.) On the western side of the Andes is a long, rainless belt. Further south in the region of the return trades the winds blow from the Pacific. What do you conclude about this part of the continent?

Pupil.— I think it must be just the other way, the rain on this side and the dry regions on that. (Pointing to the map.)

Teacher.— Your conclusion is correct. The moisture here falls on the western slope of the Andes, while the plains to the east are dry and parched. Notice the surface structure of Central Asia. Do you think it a well watered region?

Pupil.— The plateaus are surrounded by mountain chains and no matter from which direction the winds blow they strike the mountains, so there can be but little rain in Central Asia.

Teacher.— Where are the warm regions of the earth from which steam is constantly rising?

Pupil.— I think they must be at the equator.

Teacher.— Do you think there is much rain at the equator?

Pupil.— We have learned that hot air rises, and I should think when the hot, moist air struck the cold air above, it would make rain.

Teacher.— You have reasoned that out very nicely. There is a region near the equator called the Belt of Constant Rains, and on either side of this belt the year is divided into two seasons, wet and dry. During the one it rains some every day, and during the other it does not rain at all. Terrific thunder-storms occur in the Torrid Zone.

If the Torrid Zone contained no large bodies of water, do you think it would have much rain?

Pupil.— No, for there could be but little moisture in the air.

Teacher.— After a shower, what beautiful appearance is sometimes seen in the air? (Teacher sketches with colored crayons a portion of a circle on the board.)

Pupil.— A rainbow.

Teacher.— A ray of white light is made up of all the colors of the rainbow. (Teacher with a three-cornered piece of thick glass casts the sunlight on the wall.)

See, there they are. When the sun shines through falling water the light is separated in the same manner.

Pupil.— I have seen the colors of the rainbow through the spray of the fountain on the Park.

Teacher.— Yes, and when we talked about waterfalls, something was said about a rainbow.

Pupil.— You told us about a circular rainbow sometimes seen through the spray that rises from Niagara.

Teacher.— I have a large picture here. You may tell me what it represents.

Pupil.— It represents a rainstorm.

Teacher.— What do you see in the picture?

Pupil.— I see heavy clouds. The hens are running to get out of the rain. A little boy with an umbrella over his head is wading in the water. Two women are hurrying home. Everything looks wet and dismal.

Teacher.— Of what use is rain?

Pupil.— It waters the ground and makes the plants grow. It makes springs and rivers and gives us water to drink.

Teacher.— The next time it rains, I want each pupil to make a note of all he sees that is interesting. Remember, when the rain begins, how long it continues, what kind of clouds accompany it, and if it is a shower or a storm. Form a picture in your mind of things that you notice from some point of vision, and when your Geography class recites the next day after the rain, each one shall have the privilege of describing his picture. This will be as good as play, for I am sure that no two pictures will be exactly alike. You can all be

artists, and make pictures in your minds. If you ever have the misfortune to lose your eyesight you will prize the pictures that hang on "Memory's Walls" for you can see those with your eyes closed. One boy can stand at the window of his home and take his picture. Another at the door, or anywhere else, only notice from some one point everything you see that seems to be affected by the rain.

—ELIZA H. MORTON.

NOTES OF LESSON ON

SNOW.

TEACHER.— What have I in my hand?

Pupil.— A picture of many pretty stars.

Teacher.— What have I in this dish?

Pupil.— Some snow.

Teacher.— The stars in the dish are broken and massed together.

Pupil.— Is that a picture of snowflakes?

Teacher.— It is, and the next time it snows gently if you will catch some of the flakes on a piece of black velvet, you will be able to see the beautiful shapes, although a microscope would show them more perfectly.

Pupil.— Have you a microscope?

Teacher.— I have, and sometime I will allow you to look at a snowflake through it. Examine this picture very carefully and notice wherein the snow stars are alike.

Pupil.— Each one has six points.

Teacher.— A perfect snowflake always has six points or some multiple of that number. What is a multiple of a number?

Pupil.— I learned in the arithmetic class that a multiple of a number is some number it will exactly divide, as 12 is a multiple of six.

Teacher.— That was well said. You see that what you learn in your arithmetic class may be useful in your geography class. Every perfect snowflake is a collection of little crystals. Whenever a liquid becomes solid, crystals are formed, but they are not always regular and beautiful. Loaf sugar is a mass of irregular crystals. What have I in my hand?

Pupil.— It looks like rock-candy.

Teacher.— It is. Of what is it made?

Pupil.— It is made of sugar.

Teacher.— Are the crystals regular or irregular?

Pupil.— I think they are regular.

Teacher.— Did you ever notice anything in the syrup pitcher that made you think of rock-candy?

Pupil.— I have often found crystals in the bottom of the pitcher that looked like rock-candy.

Teacher.— They formed there instead of round a string. If you suspend a string in very sweet water crystals will in time form around it. After school I will show you how to make pretty alum crystals and sometime I will make some artificial snow.

(Alum crystals may be formed in a week's time by dissolving a quarter of a pound of alum in a

cup of water and suspending in it a bit of wood wound with yarn. Artificial snow may be made by placing a tall vial of aquafortis near the fire till warm and dropping in filings of silver a few at a time and then setting the vial in a cool spot.)

Pupil.— What is artificial snow?

Teacher.—Artificial snow is snow made by man. What am I making here? (Sketching rapidly on the black-board.)

Pupil.— It looks like a picture of a snowstorm.

Teacher.— When the temperature of the air is below freezing point, what must happen to the moisture in the air?

Pupil.— It must freeze.

Teacher.— What is frozen vapor called?

Pupil.— I think frozen vapor must be snow.

Teacher.— When the storm rages fiercely and the wind dashes the flakes one against another, do you think perfect snow flowers fall?

Pupil.— No, I think they are broken by the wind. Why do you call them snow flowers?

Teacher.— A little southern-born maiden on seeing, for the first time, a snow-storm exclaimed, "O mamma, mamma! the angels are throwing such lovely white flowers from heaven! Please open the window and gather me some of them!" That little girl thought the flakes looked like flowers.

Pupil.— Some flowers are shaped like stars.

Teacher.— You can easily crush a snowflake and yet enough of them would crush you. Do you remember what you were told about avalanches when you studied about mountains?

Pupil.— Yes, you read to us about the avalanches in the Alps, how whole fields of snow slide down and cover villages and bury travellers.

Teacher.—We have talked about non-conductors of electricity. So you know what a non-conductor is. Snow is a non-conductor of heat. The earth has more or less heat which it receives from the sun. Now if we spread a non-conductor of heat over any part of the earth's surface, what will be the result?

Pupil.— The heat must be kept in, but does snow keep the earth warm?

Teacher.— Like a soft blanket snow protects plants from severe frosts.

Pupil.— Snow don't keep travellers warm like a blanket.

Teacher.— Travellers sometimes dig beds in the snow and keep warmer than if exposed to the cold blasts above, but of course if help is not soon received they perish. Did you ever hear of a class of people who live in snow houses?

Pupil.— Yes, you told us about the Esquimaux who build snow houses that look like great ovens.

Teacher.— We will suppose that the snow has been falling very gently for two days. Can you form in your mind a picture of what you would see from the window?

Pupil.— Yes. I see the trees all loaded down with snow. The fence is covered with it and there is a big drift over the wood pile. The well-curb looks like the roof of a house, and the roads are all blocked up with snow.

Teacher.— The picture you have formed in your mind is somewhat like one the great poet Whittier saw when he wrote the beautiful poem called "Snow-Bound."

Pupil.— Please read us the poem, will you?

Teacher.— I have not time to read it all, I will tell you a little of the first part and read the portion that is like what you saw in your mind. He begins by saying it is a cold day in December. The boys are hurrying round doing the nightly chores, bringing in wood and feeding the cattle. It begins to snow, and snows all night and all the next day. The second morning they looked from the window and this is what the poet said they saw:

> "We looked upon a world unknown,
> On nothing we could call our own."

Why did he say that?

Pupil.— I suppose because everything looked so strange.

Teacher.— Yes. Now think of what you learned about the sky over the earth.

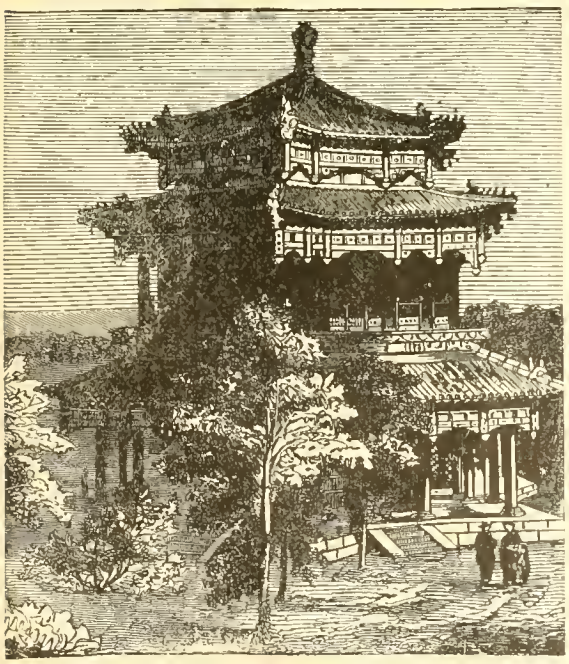
Pupil.— You told us we might compare it to a great blue bowl, only its edges do not really touch the earth, but just look so.

Teacher. — The sky is sometimes called the firmament. I will now read some more. (Teacher repeats the two lines read before.)

"Around the glistening wonder bent
The blue walls of the firmament.
No cloud above, no earth below.
A universe of sky and snow!
The old familiar sights of ours
Took marvellous shapes; strange domes and towers
Rose up where sty or corn-crib stood,
Or garden-wall, or belt of wood;
A smooth white mound the brush pile showed,
A fenceless drift that once was road;
The bridle-post an old man sat
With loose-flung coat and high cocked hat."

Does he mean that an old man sat on the post?

Pupil.— I think he means that the post looked like an old man.



CHINESE HOUSE.

Teacher.— Yes, look at this picture in my hand of a Chinese house. Notice the roof and listen:

"The well-curb had a Chinese roof;
And even the long sweep high aloof,
In its silent splendor seemed to tell
Of Pisa's leaning miracle."

Do you know what the last three lines mean?

Pupil.— What is Pisa?

Teacher.— Pisa is the name of a city in Italy in which is a wonderful tower that leans far over and yet does not fall to the ground. Here is a picture of the tower. (Teacher holds up a book containing the picture.) Do you know what a well-sweep is?

Pupil.— O yes, I have seen them in the country. It is a long pole on which hangs the bucket over the well.

Teacher.— This one that Whittier saw in his mind, being slanting and covered with snow, made him think of the tower.

Pupil.— I understand now.

Teacher.— The poem is full of pictures, and if you form them in your mind as you read, you will enjoy it very much, especially when you are older.

Pupil.— I enjoy them now.

Teacher.— I am glad to know that. I once read of a snowstorm in the house.

Pupil.— How could that be?

Teacher.— A pane of glass was accidentally broken in a room where a large party was assembled, and a gust of wind blowing through the opening froze the vapor in the apartment and scattered snowflakes over the astonished guests.

What made the vapor in the room?

Pupil.— I think it was caused by their breaths.

Teacher.— Yes, and the air from outside must have been very cold and the room very warm. One more wonderful thing. Did you ever hear of red snow?

Pupil.— Is there such a thing?

Teacher.— In Greenland there are places where the snow looks like blood. This is caused, however, by a little plant, almost too small to be visible, growing on the snow. Now you may go to the map and find Pisa, and tell me what you have learned about it.

(The children are also told to find places on the

map where there is always much snow, places where there is no snow, places where there is snow part of the year, also Greenland, the Alps, the home of the Esquimaux, and Whittier's home, the teacher telling them enough about the poet to interest them in the man, and giving them this question to think about until the next recitation: "What is the 'snow-line?'")

ELIZA H. MORTON.

NOTES OF LESSON ON

THUNDER AND LIGHTNING.

TEACHER.— What have I in my hand?

Pupil.—A glass rod and a silk handkerchief.

Teacher.— I rub the rod with the handkerchief, and hold it near these bits of paper. What is the result?

Pupil.— The bits of paper fly to the rod. What makes them do that?

Teacher. — The rubbing or friction arouses electricity.

Pupil.— What is electricity?

Teacher.— Electricity is a force that seems to pervade everything and yet no one knows exactly what it is. There are two kinds of electricity called positive and negative. The one rushes to the other when it comes near it. What do you think about the paper and the glass rod?

Pupil.— I think the paper has one kind of electricity and the rod the other.

Teacher.— That is true. Electricity is not always manifest, we usually have to make it up in order to see or feel it. How did I make it up in the rod?

Pupil.— You rubbed the rod with the handkerchief. Would a cotton handkerchief do as well?

Teacher.— No, cotton carries off or conducts electricity away faster than silk. What is a good name for objects that easily conduct electricity?

Pupil.— Why not call them conductors?

Teacher.— We will do so. Metals and water are good conductors, while rubber, glass, silk and fur are non-conductors. Did you ever rub pussy's fur the wrong way in a cold dark room?

Pupil.— Yes, and the sparks flew from her fur.

Teacher.— You woke up electricity then, so you could see it. The winds that sweep the mountains and beat against the trees produce electricity, and whenever vapor is condensed, electricity is developed. (Teacher makes dots on the blackboard, also heavy chalk rubbings, and a zigzag line.) What have we here?

Pupil.— It looks like a shower with chain lightning.

Teacher.— A wise man named Benjamin Franklin discovered that lightning is electricity. I want you to find out something interesting about this man. There is a story told about him and his kite that you would like to hear.

Pupil.— Will you please tell us the story?

Teacher. — I think I will let you ask your parents about it and then you can tell it to me at the next recitation. I like to hear stories and it isn't fair for me to tell them all. Benjamin Franklin suggested the idea of protecting buildings by means of lightning-rods. Can you think why lightning rods protect buildings?

Pupil.— I suppose the lightning runs down the rods to the ground, but I should think it would be just as likely to strike the house.

Teacher.— You have forgotten what I told you about conductors and non-conductors.

Pupil.— O yes, you told us the metals are good

conductors and I suppose the steel rods draw and carry the electricity from the clouds to the earth. I would not want the rods on my house to be broken or out of repair.

Teacher.— They should be kept in repair. Does lightning always descend to the earth?

Pupil.— No, we often see it in the clouds above the earth.

Teacher.— Some clouds are full of positive electricity while others are full of negative. When one kind approaches the other what must happen?

Pupil.— The two kinds of electricity must rush together,

Teacher.— Yes, that is the cause of lightning. When the flash occurs it pushes away the air along the line of its passage, and then the air rushes back with a great noise to fill up the space.

Pupil.— Is the great noise thunder?

Teacher.— Yes, but every one in the world does not understand this. The German children are often told that thunder is God scolding. Some Indian tribes think that thunder is caused by a mighty bird that opens his wings with the lightning flash. Do you hear it thunder before you see the flash?

Pupil.— I don't remember.

Teacher.— I think it would be more correct for you to say, "I never noticed." The next shower we have you must remember to notice, for I shall ask you about it. How many kinds of lightning have you seen?

Pupil.— I have seen chain lightning and sheet lightning.

Teacher.—If no clouds hide the spark we have chain lightning. Sheet lightning is probably the light of the flash shining through clouds. There is another kind of lightning seldom seen called ball lightning. The electricity takes the form of a globe of fire and moves slowly along.

Pupil.— It must look grand.

Teacher.— Yes, it does, and when it strikes the earth it bursts with a report like that of a cannon.

Where have you learned that the most rain occurs?

Pupil.—We have learned that the heaviest showers are near the equator.

Teacher.— Where then would you expect to hear the most thunder and see the most lightning?

Pupil.— I think the heaviest thunder storms must be at or near the equator.

Teacher.—That is the case. Thunder and lightning almost always accompany the daily rainfall in the Zone of Calms and frequent tempests occur beyond its limits. The thunder storms in the tropics are much more terrible than those that occur in the temperate regions. The thunder claps cause the very earth to shake. I will read you a description of a shower in the Torrid zone. (Teacher reads an extract from a book of travels.)

Pupil.— I would not care to live in that place.

Teacher.— We will now point to some places on the map where terrible thunder storms occur. (The children guided by the teacher indicate the regions.) There are many wonderful things to learn about electricity. When you have an opportunity I advise you to visit a telegraph office, also a factory where electricity is generated.

(In order for an oral lesson to accomplish the best results, the child should have a brief summary of the facts taught by the lesson to study. The teacher gives him ideas, and prepares his mind to understand the words in which they are clothed. His mind is not mature enough to remember the words of his teacher, and his own command of language not adequate to correctly express the ideas he has received, hence after the oral instruction he needs the help of a well-witten text-book. From the printed summary he can form topics, and from his topics write a description of the subject, and thus fasten it in his memory to remain as a seed in after years to bear an abundant harvest.)

— Eliza H. Morton.

NOTES OF LESSON ON

ICE.

TEACHER.— What have I in my hand?

Pupil.— A piece of ice.

Teacher.— What is ice?

Pupil.— Ice is frozen water.

Teacher. — Is ice heavier than water?

Pupil.— Ice floats on the water, if it were heavier it would sink.

Teacher.— Can you think why it is well that ice is lighter than water?

Pupil.— If it were not it would spoil our fun skating.

Teacher.— Fancy a river freezing over and the ice sinking as soon as it is formed!

Pupil.— After a time the river would be full of ice, the fish would all die and the river would never thaw out.

Teacher.— That would be an ice river certainly. Did you ever hear of a *real* ice river?

Pupil.— I never did.

Teacher.— What have we learned about the summits of very high mountians?

Pupil.— We have learned that their tops are always covered with snow.

Teacher.— We will model a mountain from this clay and cover its summit with snow. If the snow never melted or slid down, and more kept falling from the clouds, what would be the result?

Pupil.— The mountain would grow higher and higher until it reached the sky.

Teacher.— Such a thing as that could never happen, for the summit of even the highest mountain has a short summer during which the snow thaws a little and presses the half-frozen mass downward toward the valley like this. (Teacher illustrates by pouring a little water on the snow and forcing it down the side of the clay mountain.) During the next cold period the snow freezes and

after a time thaws again and forms a great river of ice moving very slowly to the sea. I have some pictures here that will give you an idea of how a glacier or ice-river looks.

Pupil.— The ice looks very rough.

Teacher.— It generally is. One might fancy it a rough sea suddenly frozen. Sometimes great masses of rocks are ground off and swept along by the glacier. Most glaciers move very slowly.

Pupil.— If I were on one would I know that it moved?

Teacher.— I think not, as they do not generally move more than twelve inches a day, although some have a faster motion.

Pupil.— Could I jump across one?

Teacher.— Some of them are two miles wide and fifteen or twenty miles long.

Pupil.—I did not think of their being so wide. Where are they found?

Teacher.— Where you have learned that many avalanches occur?

Pupil. — In the Alps. Are glaciers found there?

Teacher.— Yes, many of them. Some project into cultivated fields. Look at this picture. Here is a wall of ice from which trickle little streams. Near by is a green field. What will those little streams form?

Pupil.— I think they will form a river.

Teacher.— Yes. The Rhine and the Rhone both start from glaciers. Find those rivers on the map.

Pupil. — Are there any glaciers in North America and South America?

Teacher.— Yes, indeed. On Mounts Shasta and Hood are glaciers as large as those in the Alps. On the western slope of the Andes mountains in Chili and Terra del Fuego are many glaciers. You may find those places on the map. It is so cold in the Frigid Zone that the land does not need to be very high for glaciers to form. Notice my clay mountain with its glacier. We will call this dish of water the ocean. Down goes the glacier toward the sea, when it reaches the water great pieces become broken off, and float away like this. (Teacher illustrates with the ice.)

Pupil.—I think those must be the icebergs that we saw when we took our journey along the coast.

Teacher.— You have now become acquainted with the iceberg's mother. Here is a nice picture of the formation of icebergs. Notice how much of the berg is below the water.

Pupil.— It looks as though the greater part was below the water.

Teacher.— Some writers say that the part under water is eight times as large as the part above. Many icebergs come from the coast of Greenland. Where may we expect to find the most ice?

Pupil.— In the polar regions.

Teacher.—Not only icebergs are there, but also immense fields of ice which sometimes take a circular motion, and whirl round and round rapidly. Under the pressure of a storm the ice becomes broken and the fragments piled up in layers thirty or forty feet high. Icebergs smite the fields of ice, and woe to the vessel that is near the scene of confusion. The noise of the grinding and crashing of broken ice in those regions during a storm is very great.

ICEBERG.

Pupil.— I would not want to sail there.

Teacher.— No, and yet men have faced those dangers trying to obtain knowledge of those regions. The name Greenland does not make us

think of ice. What island has a name that suggests it to our minds?

Pupil.— Iceland.

Teacher.— Yes, but Iceland has a milder climate than Greenland. I should have named Iceland Fireland, because of its volcanoes. Learn what you can about Iceland before the next recitation. Let me know if you find much ice there.

Does ice ever drop from the clouds?

Pupil.— Yes, in the form of hail.

Teacher.— I will read a short description of a hailstorm that occurred some years ago in the southern part of France. (The teacher reads from a book of travels.)

Pupil.— I did not know that hail could do as much damage, or that the stones were ever so very large.

Teacher.— Hailstones are often very destructive, and masses of ice several pounds in weight have fallen from the sky. One more wonder. Did you ever hear of an ice palace?

Pupil.— Yes. I heard father telling about one built in Montreal not long ago.

Teacher.— The first ice palace of which we have a record was built in Russia by order of Empress Anna. Many poor people had no work and she ordered them to build her a house of blocks of clear ice. It was divided into rooms and supplied with ice furniture. It soon melted away, but it gave the poor people bread. Several palaces of the kind have been built in this country. You may ask your parents about them. Perhaps you can find a picture of some one of them to show me at the next recitation.

Pupil.— Papa has one at home in Harper's Weekly.

Teacher.— Very well, Perhaps he will allow you to take it to school.

I will speak of but one more thing to be learned from ice. Did you ever notice the formation of an icicle?

Pupil.— Yes, it is formed by the water running down and freezing drop by drop.

Teacher.— Icicles are often very large. If some of the drops of water are muddy, how will the icicle appear?

Pupil.— It will look soiled and dark colored.

Teacher.— Day by day you are slowly forming your character word by word and thought by thought. If your thoughts are pure and your words true, your character will grow lovely like the sparkling icicle, but if your thoughts are impure and your words untrue, your character will be like the muddy icicle, and none of the good will desire your company. When tempted to do wrong, remember the icicle.

Each child in the class should be furnished with an outline of the map of the world. They can be taught to make those, or they can be bought for a small sum. As the lessons progress, have all important facts noted on these maps. For this lesson have them indicate with blue ink several regions where glaciers are found, also icebergs and fields of ice. It is well to outline each lesson as it is given with topics. This will help the children to recall what they have learned, and may be used as an outline for a written exercise.

— ELIZA H. MORTON.

FRIDAY AFTERNOON QUESTIONS.

What countries are the homes of the following people? Name an important city of each country:

1. Mexicans?
2. Greeks?
3. Spaniards?
4. Portuguese?
5. Germans?
6. Norwegians?
7. Swedes?
8. Sardinians?
9. Japanese?
10. Moors?
11. Patagonians?
12. Hindoos?
13. Dutch?
14. Belgians?
15. Poles?
16. Russians?
17. Welch?
18. Scotch?
19. Irish?
20. French?
21. English?
22. Swiss?
23. Sicilians?
24. Turks?
25. Italians?
26. Danes.

Additions to this can be made by the pupils.

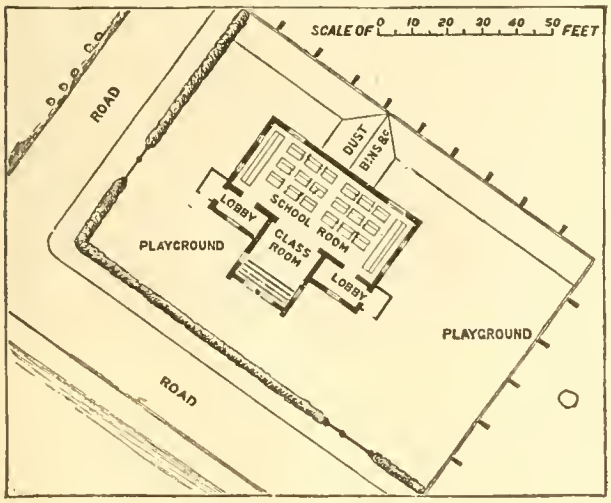
NOTES OF LESSON ON

MAP DRAWING.

A Map of the School-Grounds.— In the last lesson we began to learn how to make maps. Let us now extend our map-drawing to places beyond the school-room. Suppose we take our tape-line and get the measurements of the school-grounds; and after that is done, we shall have to mark the distances of things from one another. We will appoint two pupils to hold the tape-line tight and even, two more to write down the measurements on their slates, and two others to make the map on the black-board, after we come in. . .

And now we have the measurements on the two slates. The measurements are set down in feet. What is the next thing to be decided. *The scale.* That is right. Let us use several scales this time.

One of the two pupils who are to make the map on the black-board shall make it on a scale of four feet to the inch. But the other may draw the map on a scale of, say, eight feet to the inch. The rest of the class may use their slates, and draw their maps on a scale of sixteen feet to the inch. Be sure to use your rules carefully, and get your maps true to the scale. And when these maps are finished, we shall see that they are like three different photographs of the same face, in this way,—they are all true copies of the one real thing, though they are of three different sizes; that is, as we say of maps, they are drawn on three different scales.



PLAN OF SCHOOL AND PLAY GROUND.

Importance of the Scale.— And now you begin to see why it is that, in looking at any map, in a book or on a wall, you must never forget to notice the scale which you will find marked at the bottom of the map. For on one map an inch may stand for a mile, while on another map it might stand for a hundred, or even a thousand miles. Here is a map showing a school-house and its grounds, and the places near by. Look at the line which you see marked at the top, and tell me what its scale is. Fifty feet to the inch, you say. That is right. Now each of you may rule an inch at the foot of your map, and mark upon it the scale you have used.

Which side of the Map shall be North?— There is one more thing to do before the maps are completed. You have made your maps just as the grounds lie. Now which side of your map stands for the north side of our school grounds? Mark that side north. Maps are usually made *with the top for the north.* Now turn your slates, so that the north side shall be at the top. If the maps on the black-board are not made with the top for the north, we shall have to make them over again, for we cannot turn the black-board round. Now, when the top is north, which sides will be south, east, and west? Mark these directions upon your maps, and they will then be complete.

A still larger Map.— Do you think that

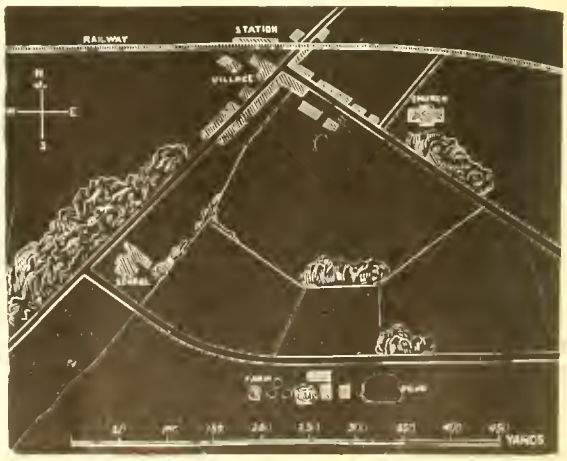
now we can make a map of a farm divided into fields? You can easily mark the house, the barns, the stables, the orchard, the lane up through the middle of the farm, and a piece of woods at the back, with a creek running through it.

To the Teacher.—If your school is in a town or city, and some of the pupils are unacquainted with a farm, let them make a map of the streets and blocks in the immediate vicinity of the school, instead of a map of a farm.

EXERCISE.

1. Name the principal roads or streets, nearest your home, which run east and west.
2. Name those which run north and south.
3. What is the direction of the road in front of the school-house gate?
4. What is its width?
5. Are there any streams near the school-house? In what general direction do they run?
6. Make a map of a garden. Mark the paths, flower-beds, trees and shrubs. Put dots to represent the trees and shrubs.
7. Draw a map of two roads, or streets, crossing each other. Represent a house at one corner and two trees at another corner. Put in a crooked line to stand for a creek crossing one of the roads a little way from the corners.
8. State the direction of the nearest post-office from the school. Mark the position of both the school and post-office on the black-board, and indicate correctly the directions of the roads joining them.
9. What is the nearest railroad? Which way does it go?
10. How many miles distant is the nearest town or city? Represent the direct distance by a line, using a scale of two miles to the inch.
11. Make upon the black-board a map which will show the school-house, the city, and the railroad, in their proper positions, and the directions of the roads joining them. Use a scale of one mile to the inch.
11. Make upon the black-board a map which will show the school-house, the city, and the railroad, in their proper positions, and the directions of the road joining them. Use a scale of one mile to the inch.
12. Explain the difference between a picture and a map.
13. Which direction should the top of a map represent? Which the bottom? Which the right side? Which the left side?
14. If a map be laid upon the floor, what part of it should face the west?
15. If a map be hung on a wall, what direction does the upper part of the map represent?
16. If a fly is crawling up towards the top of a map upon a wall, is the fly travelling to the north?

A Map of a Town.—Here we have a map of a village. There is one main street going north-east and south-west, and another going north-west and south-east. You see that the railroad runs east and west, and that the church lies to the east of the town. Now, *notice the scale*. One inch, you see, stands for 200 yards. Take a narrow piece of paper, and mark it off in inches very exactly, and use it to measure the distances on the map. You need not measure by the roads, but straight across, "as the bird flies." Since



PLAN OF A VILLAGE.

one division of the paper measures 500 feet, we find, by applying the paper to the map, that the church is about 200 yards from the centre of the little town.

To the Teacher.—Help the pupils to make a map, similar to the above, of the village, or of the school section in which they live. But if your school be in a large town or a city, let them make a map of as many of the blocks and streets in the vicinity of the school

as you think they will be able to do well. Before entering upon the work of the next section, explain fully to the pupils what a township is.

A Map of a Township.— Most of our townships are bounded by straight lines. Many of our roads also are quite straight, and cross each other at right angles. Now, if you can find out the distances from corner to corner of the township in which you live, and then the number of roads running north and south, and also of those running east and west, I think you can make a map of it. You would first decide upon a scale One mile to the inch would be a good scale to use. Apply your scale and lay down everything on your map as accurately as you can. Draw the boundary roads first, then the other roads. After the roads are all drawn, mark down what rivers, creeks, lakes or ponds there may be, and the railroads, if there be any; also mark down as many school-houses, churches, mills, factories, foundries, hotels, etc., as you can. Probably there will be some places in the township which you have not visited; you may ask your friends about these.

In drawing your map avoid the crossing of lines where roads meet. You see that the rivers and creeks are marked by irregular, wavy lines. On your map mark villages and towns with a black dot (●); and cities with a square (■).

If you wish to mark a lake or part of a lake, you may represent the water by fine lines ruled parallel to the bottom of the map; or you may draw wavy lines round the borders. Ridges of hills may be shown by a series of crosses (xxxxx). Mountains are generally marked with a dotted line. The lettering should be neatly done, and you should write the names upon a clear space as far as you can.

EXERCISE.

1. In what county do you live?
2. How many townships does it contain?
3. Write down their names in order.
4. In what township do you live?
5. What railroads pass though your county?
6. What are the names of the towns in your county?
7. Which of them is the county-town?
8. What public buildings are there in that town?
9. Why is it called the county-town?

THE MAP OF THE STATE.

We will now have a talk about the map of the State in which we live, and you must learn how to obtain from it much knowledge of the shape of our State, of its natural features, and also of its counties, towns, cities, railways and canals.

To the Teacher.— This lesson (or series of lessons) is of great importance, and it ought not to be passed over quickly. Great care should be taken to keep the pupils interested in their work, lest they become weary of the study of Geography before they have well begun it. The entire object of the lesson is to familiarize the pupils with the methods by which Geographical ideas are represented on maps; not to teach facts about their State except incidentally. Success can be secured only by letting the pupils work for themselves, and by bringing into activity their faculties for discovering, comparing and proving. The following hints as to the order to be pursued may be of service: — Having tested the pupils' knowledge of the cardinal points as represented on the map, let them first distinguish between *water* and *land*. They might be taught also to distinguish between the land of our own country and that which does not belong to us. Then *lakes* should be discovered by them; then *bays* and *gulfs*; then *straits*; then *rivers*. Then the simpler land features should be discovered: *islands*, *peninsulas*, *capes* and *isthmuses*. The *valleys* can be inferred from the river courses. Then should be looked for, *hills* and *mountains*. It may then be explained what parts of the State are *lowlands*. Then the terms *head-water*, *river-basin*, *tributary* and *water-parting*, should be exemplified,— in fact, as many as possible of all the terms referring to natural features previously learned. This much accomplished, the division of the State into *counties* should be noticed; the pupils' own county located, and its *relation* to other counties observed. Then the method of marking *villages*, *towns* and *cities*, should be learned, the *positions* of some of the more important of them be located, and their *directions* from the school-room approximately ascertained. Similarly, the *distances* of the more

important cities from one another and from the schoolroom should be ascertained by the use of the scale. Then the marking of *railways* and *canals* should be learned, and the routes of one or two of the more important railways traced. Finally, a *thorough*, *general review* from the map should be made of the whole State, — its boundaries, lakes, rivers and bays, water-partings, inland rivers, inland lakes, counties, railways and canals. The cardinal principles to be observed are: (1) That the pupils must obtain their information by their own searching, not by being told everything; (2) that it is the teacher's duty to see that this searching is done systematically, and not in a hap-hazard sort of way.

NOTES OF LESSON ON

THE GEOGRAPHY OF A STATE.

Outline of the State of Pennsylvania.

1. Pennsylvania.
1. Map drawn of same on slate, giving principal rivers, cities and mountains.

2. Extent.
1. Definite size.
   - *a.* Greatest length in miles.
   - *b.* Greatest breadth in miles.
   - *c.* Area in square miles.
2. Comparative — by reference to some other State or States.

3. Surface.
1. At the home of pupil — the local geography.
2. General characteristics; as, (*a.*) Level, (*b.*) Undulating, (*c.*) Mountainous.
3. Mountains. Only the principal mountains of the State.

4. Rivers.
1. Description of particular rivers. (*a.*) Where they rise, direction they take, and into what waters they flow.
2. Rivers of the particular locality.

5. Climate.
1. As determined by latitude.
2. As modified by particular causes — altitude, or proximity to the sea or Great Lakes.
3. At the home of the pupil, — local geography.

6. Natural Advantages.
1. At the home of the pupil.
2. On the surface of the earth.
   - *a.* The soil with reference to agriculture.
   - *b.* Forests — nature and use of woods.
   - *c.* Facilities — transportation afforded by rivers and railroads.
3. Within the earth.
   - *a.* Useful minerals and metals.

7. Occupations.
1. Agriculture.
   - *a.* Relative importance among the industries of the State.
   - *b.* The crops raised.
   - *c.* Cattle, sheep and hog raising.
2. Manufacturing.
   - *a.* Articles manufactured.
3. Mining.
   - *a.* Metals and minerals found.
   - *b.* Mines, to what extent worked.
4. Lumbering.
   - *a.* Locality of the forests.
   - *b.* What kinds of woods.
5. Commerce.
   - *a.* What is exported.
   - *b.* What is imported.

c. Means of transportation.

8. Education.

1. Higher institutions.
   a. Universities and Colleges.
   b. Schools of Law, Medicine and Theology.
   c. Normal Schools.
2. Common Schools.
   a. Number of pupils attending.
   b. State Superintendent and Board of Education.
   c. Local School Officers.

9. Government.

1. Legislative Branches.
   a. Names of "Houses."
   b. Time of election of members.
   c. Sessions of the Legislature.
2. Executive Department.
   a. Term of the Governor.
   b. Name of the present Governor.
3. The Judiciary.
   a. Supreme Court.
   b. Circuit Courts.
4. County, township, or city officers.

10. Counties.

1. County in which pupil resides.
2. Number of counties in State.

11. History.

1. Early History.
   a. Colonial Period.
   b. Date of admission of State.
2. Subsequent growth and present population.
3. Distinguished Men.

12. Cities.

1. The Capital and Metropolis.
   a. Population.
   b. Industries pursued.
   c. Description of striking objects.
2. Other leading cities.
   a. Where situated.
   b. On what rivers, if any.

I would have the pupils draw the map of the State on their slates while at their seats, and bring their work to class. I would expect the drawing to be neat and fairly accurate, with the principal cities, rivers and mountains of the State located. The above outline would be enough for three ordinary lessons. Having placed part of the outline on the board, I would allow the pupils to use all the books on the subject that they could get for reference. I would expect them to get the subject so well as to be able to write a good description of the State after coming to class. After finishing the outline of the State, I would put a stencil map of the State on the board, and have the pupils insert the principal rivers, cities and mountains. This would test their imagination as well as their knowledge of map drawing.

Here are a few questions for review, to be used in connection with these lessons:

1. When and by whom was Pennsylvania founded? Why founded?
2. Bound the State and name its capital.
3. Name the principal rivers, tell where they rise, what direction they take, and into what waters they flow.
4. Name and locate the principal cities, if you can; state the industries of these cities.
5. What minerals and metals are found in this State?
6. What are the industries of the people?
7. What and where are the following: Media, Erie, Blue, Altoona, West Branch, York, Conemaugh, Chestnut Ridge, Alleghany, Scranton, Laurel Ridge, Mauch Chunk, Delaware, Pottsville.

—A. D. BITTNER.

HINTS ON PRIMARY GEOGRAPHY.

TO assist the pupils in remembering the names and locations of the grand divisions, associate with the places as they are pointed out on the globe and on the map, familiar people, animals and productions, somewhat as follows: North America, the country in which we live; South America, the home of the monkey, and the place where Brazil nuts, cocoanuts, and India-rubber are obtained; Africa, the home of the negro, the camel, ostrich, lion, and zebra; Asia, the home of the Chinese, of the elephant, the tiger, and the place where tea, pepper, cloves, and cinnamon grow: Australia, the land of the Kangaroo; Europe, the home of the English, Irish, German, French, Italians, etc.

In a similar manner the names and locations of countries and other places may be learned; as, Greenland, the home of the white bear; and the waters around it, the home of the whale, from the mouth of which whalebone is obtained; West Indies, the place whence we obtain oranges, bananas, etc.; Spain, the country where cork and raisins are produced.

The most important groups of islands, two or three of the largest rivers and prominent ranges of mountains, and a few of the largest cities of the world may be included in these lessons; also the cold and warm countries may be pointed out: *the boundaries and capitals of countries should not be taught.*

Care should be taken that the pupils do not obtain the false impression that, to travel from a place represented at or near the bottom of a map, toward a place represented at or near the top of the map, one must *go up.* In leading the pupils to avoid this common error, point out the course of the St. Lawrence River, and cause them to understand that its waters flow *down* toward the northeast, and *not upward.*

The relative direction and location of places may be easily illustrated by simple dots on the black-board and on slates.

—S.

STATE NICKNAMES.

Taking the States in alphabetical order, their nicknames, as far as we can ascertain at present, are as follows: Alabama, Lizard State; Arkansas, Toothpick; California, Golden State; Colorado, Rover; Connecticut, Wooden Nutmeg; Delaware, Muskrat, otherwise the Blue Hen's Chicken; Florida, the Beaver State; Illinois, Sucker; Indiana, Hoosier; Iowa, Hawkeye; Kansas, the Jay-Hawker; Kentucky, Corn-Cracker; Louisiana, Creole; Maine, Fox, otherotherwise Lumber; Maryland, Gray Vampire; Michigan, Wolverin; Minnesota, Gopher; Mississippi, Tadpole; Missouri, Puke; Massachusetts, Bay State; Nebraska, Big Eaters; Nevada, Stage Hen; New Hampshire, Old Granite; New Jersey, Blue, sometimes Clam Catcher; New York, Knickerbocker, or Empire; North Carolina, Old Tar; Ohio, Buckeye; Oregon, White Foot, or Hard Case; Pennsylvania, Broadbrim; Rhode Island, Gun Flint; South Carolina, Palmetto, or Weasel; Tennessee, Whelp; Texas, Beef-Head; Vermont, Green Mountain; Virginia, Pitch; Wisconsin, Badger.

EXERCISE IN DIRECTION.

1. Name the direction of your own home from the school.

2. Name the direction of the nearest church from the school.

3. If you were to walk from the nearest post-office to the school, name the direction and the distance of your walk.

4. What is the name of the nearest river or creek?

5. Give its direction and distance from the school.

6. In what general direction does the water run?

7. Where is the nearest town or city? In what direction is it from your house?

8. Mention in proper order the different directions in which you have to walk in returning home from school by the streets or roads.

9. How many yards wide is the nearest road?

10. How many feet wide is this room?

11. How long is it?

12. How many windows are there on the south side of the school-room? How many feet wide is each window?

13. What is the length of the play-ground?

14. Name the directions of the lines which might be drawn between opposite corners of the school-room?

15. If the moon is rising just as the sun is setting, describe the direction of a straight line joining them.

16. What is the direction of a railroad which crosses at right angles a river running S. W.?

17. A ship was sailing south and was struck squarely on the left side by a steamer and sunk; in what direction was the steamer going?

QUESTIONS IN COMMERCIAL GEOGRAPHY.

1. Mention three railroad lines and one water line which connect Chicago with the Atlantic seaboard.

2. Name five important products of manufacture in the United States, together with the name and location of the place in which each is manufactured.

3. What four important minerals are obtained in large quantities in New York and Pennsylvania?

4. What large region of the United States is particularly adapted to agriculture? Name two important products of the northern and three of the southern part of this region.

5. Name and locate cities connected by one of the submarine cables.

6. In making the journey from San Francisco to New York by a direct railroad route, name the large cities through which you would pass.

7. Describe the most direct water route from New York to Bombay.

CANALS.

BLACKBOARD PLAN.

I. Canals, kinds of { barge. / ship.

II. Use of { barge canals cheapen transport, / ship canals shorten distances.

III. How canals are made, or construction of.

- *a.* Difficulties in the way { 1. Unevenness of surface. / 2. Destructive rivers. / 3. Too great or too small a supply of water.
- *b.* Construction of canals in low countries. { Form of the channel facing, puddling, aqueducts. / Supply regulated by { reservoirs, / pumping engines, / side channels.
- *c.* Construction of canals which cross elevations. { Rock-cuttings. / Locks { how made, / how used.

IV. Some of the most famous canals of the world.

- *a.* Barge canals { Those of China. / Those of the United States.
- *b.* Ship. { Suez { Description. / Construction. / Advantage of. / Panama { Description. / Construction. / Why more different than the Suez. / Advantage of.

A SCHOOL LOG BOOK

The teacher may add interest to the school for a time, and give different pupils some real work in composition, by securing a suitable blank book and asking the school to select each week a secretary to keep in this book the log or diary of events for that week. Let each day's events be noted carefully. Enough ludicrous incidents occur in any school to render the Log Book spicy. Arrange a little badge for the secretary, to add a little dignity to the office. Elect secretary by ballot according to regular usage.

—MODERATOR

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